THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XVII. No. 405—20th YEAR.] LONDON, APRIL 28, 1868. [Subscription per Ann. 15s. in Advance 18s. Credit. DOUBLE No. Price 1s.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis by Dr. FYFE, M.D.:—
9746 cubic feet of gas per ton of coal.
26-candle gas.
13¼ cwt. coke per ton of coal.
N.B.—Ramsay's Cannel most resembles the Marquis of Lothian's Cannel, but superior as to coke.
RAMSAY'S PATENT CONDENSED COKE,
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828.
FIRE-BRICK WORKS, established 1804.
FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire Clay.
The Fire Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article.
The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the works are the most extensive in the Kingdom.
Manufactories: DERWENTHAUGH, SWALWELL, and HEBBURN QUAY. Offices: BROAD CHARE, NEWCASTLE-UPON-TYNE. Address, G. H. RAMSAY.

GEORGE GLOVER & CO.,
Patentees of the Standard Gasometers for the Government, and of the
IMPROVED DRY GAS-METERS.
These Meters are warranted to measure correctly and not to vary, and have come into general use more rapidly than any Meters hitherto manufactured.
1862.
CLASSES X. AND XXXI.
CLASS X.—"*For ingenuity, completeness, and efficiency of apparatus used in measuring gas, and for excellence of material and workmanship.*"
CLASS XXXI.—"*For superiority of construction and workmanship.*"
Particulars and lists of prices forwarded on application to Ranelagh Works, Ranelagh Road, Pimlico, LONDON, S.W.; 15, Market Street, MANCHESTER; or 127, Boulevard de Magenta, PARIS.

IMPROVED GASLIGHT.
Ample experience has proved that, by carburetting common gas, its illuminating power may be doubled or even tripled, and its consumpt greatly lessened. Wax candles and oil lamps in consequence are being rapidly superseded, and gas is now used in many private houses and mansions where formerly it was not tolerated.
Information as to the apparatus, fluids, &c., may be had of GEO. GLOVER and CO., or CARLESS, BLAGDEN, and CO., HACKNEY WICK, N.E.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

FIRST PRIZE IN THE PARIS EXHIBITION.
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THE OLD TUBE WORKS,
CHURCH HILL, WEDNESBURY;
ALMA WORKS,
WALSALL, STAFFORDSHIRE;
and 69, UPPER THAMES STREET, LONDON,
Original Manufacturers of Wrought-Iron Gas Tubes and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest Orders may be executed in a few days.
Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanised Tubes, &c.
N.B. All Goods thoroughly Tested before sent out, and Warranted.

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WET AND DRY GAS-METER
AND
STREET-LAMP
MANUFACTURERS,
BELL BARN ROAD, BIRMINGHAM.
ESTABLISHED 1830.
All materials found for the alteration of Public Lamps for lighting with the Rod. Regulators with Lava Burners.

BLAYDON BURN AND LOW BENWELL FIRE CLAY RETORT AND FIRE-BRICK WORKS, NEAR NEWCASTLE-ON-TYNE.
WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.
London Agents: JAMES LAWRIE & CO., 63, OLD BROAD STREET, CITY, LONDON.

THE "LOTHIAN" CANNEL COALS.
These Cannels are extensively used in the Gas-Works of Edinburgh, where the illuminating power of the gas is the highest in Britain.
The yield per ton is 12,573 cubic feet; illuminating power 33·8 standard candles; coke per ton 1046 lbs.
Ports of Shipment, in the Firth of Forth.

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The yield per ton is 10,650 cubic feet; illuminating power 24 standard candles; coke per ton 1216 lbs.
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For prices and other information, apply to Mr. JOHN ROMANS, C.E., 53, Frederick Street, EDINBURGH.

NOTICE.
LESMAHAGO GAS OR CANNEL COAL.
JAMES FERGUSON & CO., Auchinheath COLLIERY, LESMAHAGO, and the NITSHILL & LESMAHAGO COAL COMPANY, AUCHINHEATH AND SOUTHFIELD COLLIERIES, LESMAHAGO, sole Proprietors and Producers of the above celebrated GAS COAL, beg to intimate to Gas Companies and other consumers that, having reason to suspect that Cannel or other Coal of very inferior quality, both as regards the quantity and illuminating power of the Gas, has frequently been mixed with and sold under the name of "Lesmahago," they have now appointed Messrs. JAMES LAWRIE & Co., of 63, Old Broad Street, LONDON, E.C., sole agents for England; and Messrs. LA COUR & WATSON, of LEITH, sole agents for foreign markets; and, in order to prevent a recurrence of the frauds named, they request that all purchasers will send their orders through the above-named firms. Orders for other than the above-named markets may be forwarded direct to either of the Proprietors.
The Proprietors will, in future, use their own forms of bills of lading, and also issue certificates of origin, signed, as the case may be, either by JAMES FERGUSON & CO., or by the NITSHILL & LESMAHAGO COAL COMPANY; and they request all consumers purchasing Lesmahago Coal to demand such a certificate for each cargo, and to observe that it corresponds with the bill of lading.
Auchinheath, Lesmahago, March, 1868.

GEORGE GLOVER & CO.

Patentees of the Standard Gasometers for the Government,

TWO MEDALS,

LONDON, 1862.

HAVE OBTAINED THE
HIGHEST
PRIZE
FOR

SILVER MEDAL,

PARIS, 1867.

IMPROVED DRY GAS-METERS AND GASOMETERS,

AT THE
PARIS EXHIBITION.

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1862.

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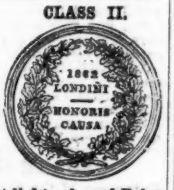

This Paint having been in general use over six years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (28s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

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N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs under 20s. per cwt., as compared with White Lead at 28s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

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1795.

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THE ORIGINAL

WORTLEY FIRE-BRICK WORKS.

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210,000 IN USE.

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GAS-METER MANUFACTURERS.

STATION-METERS ANY SIZE.
PHOTOMETERS, EXPERIMENTAL METERS,
PRESSURE-GAUGES, &c.
Price List on application.
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HARRIS and PEARSON,

PROPRIETORS OF
BEST CLASS-HOUSE POT AND CRUCIBLE CLAY
MANUFACTURERS OF
FIRE BRICKS, GAS RETORTS, &C
AMBLECOTE FIRE CLAY AND BRICK WORKS,
STOURBRIDGE.
Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.
NB A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches. 16 inches.
D's, 16×12, 15×14, 20×16, 16×18.

INTERNATIONAL EXHIBITION,
1862. CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,

THROCKLEY,
NEWCASTLE-ON-TYNE.

THOMAS CARR & SON,

MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c. &c.
SCOTSWOOD FIRE-BRICK WORKS,
NEAR
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(Established 1820,)
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GAS AND WATER WORKS.

WOOD SIEVES for GAS PURIFIERS.

THE BEST AND CHEAPEST
CAN BE PURCHASED FROM
T. COULTHARD, WEST STRAND, PRESTON,
LANCASHIRE.

HANCOCK'S INDIA-RUBBER GAS-TUBING.

All sizes, from ¼ in. to 4 in. diameter and upwards.
Also,
HORSE SINGEING APPARATUS, best make, with GAS-BURNERS, COMBS, and INDIA-RUBBER TUBING, all complete.
INDIA-RUBBER BAGS for GAS-MAINS.
WASHERS for GAS and STEAM JOINTS.
VALVES (pure solid Rubber) for STEAM-ENGINES.
PACKING (Elastic) for STEAM-ENGINES.
FLANGE TUBING, for excluding Draughts and Dust through WINDOWS, DOORS, and GLASS CASES.

Section.

Illustrated Price Lists on application.

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Vulcanized India-Rubber Works,
GOSWELL MEWS, AND 266, GOSWELL ROAD
LONDON, E.C.

Established 1811.

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And every Description of
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Including
MEDIÆVAL FITTINGS for CHURCHES, &c.

Large Pattern Books complete, with Book of Prices, 7s. 6d.

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THE ONLY PRIZE MEDAL AWARDED FOR TUBES AND FITTINGS.

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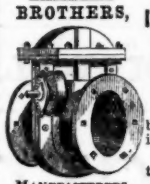

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WITH WROUGHT-IRON PINIONS.

2, 2½, and 3 in.... 12s. per in.
4 in. to 6 in..... 11s. „
7 in. to 12 in..... 10s. „

These Valves are all proved on both sides to 30 lb. on the square inch before leaving the works.
Valves made with outside racks to order.
Also Water-Valves, with gun-metal faces and gun-metal screws.

TO GAS COMPANIES AND THE TRADE.

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MANUFACTURERS OF
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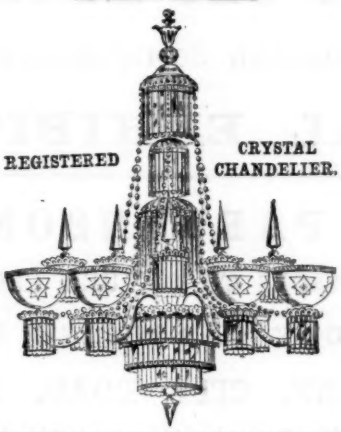
IMPROVED CRYSTAL STAR & SUN LIGHTS;
VESTIBULES,
IRON BARREL, COMPOSITION TUBING,
AND
GAS-FITTINGS OF EVERY DESCRIPTION.

WORKS:
LONDON, BIRMINGHAM, AND PARIS.

REGISTERED CRYSTAL CHANDELIER.



Special Designs prepared in perfect accordance with architectural arrangements. Estimates furnished for the Lighting and Fitting up of Theatres, Music-Halls, and Public or Private Buildings with Gas.

GAS MOONS OF THE NEWEST DESIGNS.
The Patent Gas-Regulator & Purifier reduced to 6s. 6d. per Dozen.
Pattern Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1868, are now complete.

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PHŒNIX IRON-WORKS,
GLASGOW,
Manufacturers of all kinds of
GAS AND WATER PIPES,
Branches, Bends, Water-Traps, Tank-Plates, Valves, and general Castings. Also
RAILWAY CHAIRS & SLEEPERS,
AND
GRIFFIN'S PATENT PERMANENT WAY.
London Office, 63, Old Broad Street.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, Ghent.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
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SOCKET, FLANGE, HOT-WATER PIPES, AND ALL CONNEXIONS; RETORTS, HYDRAULIC MAIN, LAMP-COLUMNS, &c.; AND EVERY DESCRIPTION OF CASTINGS AND WROUGHT-IRON-WORK FOR GAS AND WATER-WORKS, STEAM, AND GENERAL PURPOSES.
N.B.—All goods kept in stock, and supplied at wholesale prices. Estimates given, and orders by post punctually attended to the same day.

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AND
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N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.
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Established 1840.

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DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.

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GIRDERS, COLUMNS, RETORTS, AND GENERAL CASTINGS,
quoted for on application to
GEO. BOWER,
MILTON IRON-WORKS,
WEST HARTLEPOOL.
N.B.—A large stock of 2 to 8 in. pipes usually ready for immediate delivery.

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Gas Engineers and Contractors,
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Contractors for Gas-Works of any size at home or abroad. Copy of testimonials from numerous Gas Companies can be had on application.

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GAS ENGINEERS,
MANUFACTURERS AND CONTRACTORS FOR GAS-WORKS
Of any extent at Home and Abroad,
GOWTS BRIDGE WORKS, LINCOLN,
AND
JOHN STREET, ADELPHI, LONDON, W.C.

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WENLOCK IRON WORKS,
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Plans, Specifications, and Estimates prepared.

ADDISON POTTER,

WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire-Bricks, and every description of Fire-Clay Goods.

THE

UNIVERSAL EXHIBITION OF PARIS,

1867.

SILVER MEDAL.

THOMAS GLOVER,

DRY GAS-METER MANUFACTURER,

CLERKENWELL GREEN, LONDON,

HAS BEEN AWARDED THE HIGHEST PRIZE FOR

DRY GAS-METERS,

BY THE IMPERIAL COMMISSIONERS FOR THE

UNIVERSAL EXHIBITION, 1867.

WILLIAM PARKINSON AND CO.

(SUCCESSORS TO SAMUEL CROSLEY),

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

PATENT IMPROVED WET METER.

W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sale of Gas Act.

"It is well known that n Meters constructed so that the valve will close when the water is drawn off to such a point as to render them 3 per cent. slow the lights are liable to be extinguished by the closing of the valve by a sudden increase of pressure. To meet this difficulty, Mr. Pinchbeck has invented an ingenious and simple arrangement by which the action is reversed, and any such increase of pressure, in his Meter, raises the value instead of depressing it. The fact of the improvement having been adopted by Messrs. W. Parkinson and Co. is a sufficient guarantee that it practically and effectually remedies the inconvenience it is designed to meet."—JOURNAL OF GAS LIGHTING.

PATENT IMPROVED DRY METER,

Which W. P. and Co. pledge themselves to manufacture with the same quality of materials and workmanship as in their Wet Meter, thereby giving Gas Companies and others the advantage of procuring a first-rate Dry as well as a Wet Meter, which, hitherto, they have been unable to do.

STATION-METERS AND GOVERNORS,

Which can be seen at all the London Gas-Works. Also Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

TEST GASHOLDERS, EXPERIMENTAL METERS, EXHAUSTER REGULATORS,

MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

ERRATUM.

Eastbourne Gas Bill.—The engineer of this company, who was examined before the committee of the House of Commons, was Mr. Alfred Williams—not Mr. Alfred Jones, as erroneously stated in our report of the proceedings.

NOTICES.

The subscription to the Journal is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders should be made payable at the Money-Order Office, London, to William B. King, 11, Bolt Court, Fleet Street, by whom the business department of the Journal is conducted.

The next number will be published on Tuesday, May 12, and the subsequent numbers on each successive alternate Tuesday.

This Journal has been duly registered at the General Post-Office for transmission abroad.

All communications for the Editor to be addressed, "No. 42, Parliament Street, Westminster;" and all remittances for subscriptions or orders for advertisements to the Publisher, No. 11, Bolt Court Fleet Street.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 28, 1868.

Notes upon Passing Events.

The lectures on food which have been delivered by Dr. Letheby at the Society of Arts, under the "Cantor" Foundation, are a valuable and permanent contribution to the literature of Europe on a very important subject. The Society of Arts, in the administration of this Cantor Fund, offers an example which might be followed with advantage by societies like the Royal Agricultural and the Highland, which devote large funds to obtaining prize essays—generally worthless. The Society of Arts has engaged eminent men to deliver lectures, each in his speciality; and these lectures, as we before said, are a permanent addition to the library of science popularized. In noticing Dr. Letheby's lectures, we shall confine our condensed extracts to those passages which every one can understand, taking it for granted that those competent to follow the scientific arguments will consult the original reports, either in the medical press, where the lectures were first published, or in the volume which Dr. Letheby will, no doubt, do the English-speaking world the favour of publishing. Tables have been more than once issued showing the proportions of different food required to yield a certain number of grains of nitrogen, or to show the nutritive value of certain foods; but these, although very proper subjects for the investigation of men of science, are of very little value in a popular sense—so much depends on various modifying agencies, on cookery, powers of digestion, climate, and admixture of food. Dr. Letheby early observes that all foods are derived from the vegetable kingdom. In other words, "All flesh is grass," "for no animal has the power of associating mineral elements "and forming them into food." It would be a curious question to raise to a party which had just consumed a prime sirloin—how much guano, superphosphate, and farmyard manure had gone, by the intermediation of grass, hay, turnips, and oilcake, to the construction of that beef. Whether the laboratory may eventually manage to manufacture meat is a question which we have not yet commenced to solve. "Man (at pre-"sent) is a destructive, not a constructive animal." Dr. Letheby begins with the value of vegetable food. Wheat stands first in Europe. In England, fine flour is worth 10s., when seconds are worth 7s. 9d., and seconds are, practically, the best for domestic use. The attempts to restore the use of more bran in flour have not been successful, and it is not at all certain that they ought to be. At any rate, navvies believe that white bread is more easily digested than brown bread. Bran has frequently a very irritating effect on the intestinal organs. In practice, 100 lbs. of flour will make from 133 to 137 lbs. of bread; so that a sack of 286 lbs. should yield ninety-five 4 lb. loaves. The baker increases this quantity by hardening the gluten with alum, or with 3 lbs. or 4 lbs. of rice, which, boiled to a gummy mess, will make the sack of flour yield one hundred 4 lb. loaves. Scotch oatmeal is more nutritious than English; but oatmeal is not so economical a food as wheat flour. In 1695, before tea and coffee were common drinks, it appears, from an advertisement quoted in the lectures, that there was a large consumption of water gruel "at the Marine Coffee "House, Birchin Lane, Cornhill." The value of barley and rye bread we need not stop to discuss. Philosophers recommend them to the poor, but the poor abandon their use as soon as they can get wheat bread. Maize, or Indian corn, on the other hand, has been established in Ireland as a staple of food ever since the potato famine. Yet, although rich in nourishing matter, it will not make good bread. It is either cooked by baking it into cakes, or by stirring it into boiling water or milk, thus making it into a sort of hasty pudding, flavoured with salt, butter, or treacle. That is the method adopted in Ireland. When deprived of its gluten and harsh flavour by means of a weak solution of caustic soda, and then dried, it forms the expensive food called "corn-flour." Rice is never eaten alone in any country. Pulse—viz., *peas, beans, and lentils*—are very nutritious where they can be digested. "Nothing but the most "prolonged cooking will serve to help in this particular." They are deficient in carbonaceous constituents, and therefore invariably eaten with fat. Thus beans and bacon, and butter with peas, are inseparable in this country, while in the backwoods of Canada haricot beans boiled and then fried with salt pork are the standing dish of the wood-cutters. Potatoes, according to their price, are the most economical food, but the nutritive value is not great. They are deficient in fat, and should be accompanied with dripping, or better still with milk, if meat or fish cannot be had. On potatoes and milk a family of children can be reared well. "Potatoes are best cooked in "their skins, for the waste is then only about 3 per cent., or "half an ounce in a pound, whereas if they are peeled it is "three ounces in a pound. Mealy potatoes are the most "digestible; late in the season, when they are waxy, they are "best cooked by stewing. Potatoes are one of the best anti-"scorbutics, and are therefore used fresh or preserved in all

" sea-going vessels. There is little nutriment in the garden " vegetables in common use. They are much less nutritious " than the potato, and they are chiefly valuable for their anti- " scorbutic properties, for their quality of flavouring insipid " food, and diluting strong ones." Cheese theoretically ranks high for nutritive power, being especially rich in nitrogenous matter, but it is extremely difficult to digest, and cannot therefore be taken in large quantities. When cream is added to new milk, and the mixture is curdled, it forms rich cheese, such as double Gloucester and Stilton. When new milk alone is used the cheese is still rich, such as Cheddar. When an eighth or a tenth of the cream has been removed it produces single Gloucester or Cheshire. When all the cream has been removed it forms the poor, hard cheese of Norfolk, Suffolk, and South Wales.

Almost all Europeans eat meat if they can get it. Although during the Irish famine it was found that the people preferred stirabout to meat-soup, when Irishmen settle in England or America they become as much meat-eaters as their neighbours. We have no reliable statistics of the consumption of meat by the working classes of the metropolis. Dr. Wynter has guessed the consumption at 4½ oz. per head, which would be 2½ oz. less than the consumption of Paris; but, although the French utilize a large quantity of meat for soup and stews which could not be used under our system of cookery, we altogether doubt the correctness of the comparison, especially as meat is cheaper, wages higher, rent lower, and bread less eaten in London than in Paris. The amount of bone in beef is rarely less than 8 per cent.; in the neck and brisket it is about 10 per cent., and in the shins and legs of beef it amounts to one-third or even half of the total weight. The most economical pieces are the round and thick flank, then the brisket and sticking-piece. Horseflesh, Dr. Letheby says, is considered on the Continent superior to beef; and no doubt a steak from a fat horse is better than one from a lean milch cow or patriarchal bullock. Good bacon should not lose more than 10 to 15 per cent. in cooking. Experience has taught what science has proved—viz., that the large amount of carbonaceous matter in bacon makes it the best addition to substances rich in nitrogen, such as eggs, veal, poultry, liver, beans, and peas. Dr. Letheby remarks that " fish is not a favourite article of " diet with the labouring classes, unless it is salted or smoked, " perhaps because it does not easily satisfy hunger and is " quickly digested;" but it is more probable that the cause rests in the necessity of more elaborate cooking and appliances for certain kinds of fish. " Whiting, cod, haddock, sole, " plaice, flounder, and turbot are, according to analysis, " deficient in fat, and want butter; but mackerel, eels, sprats, " and herrings are much richer in oily matter, and are much " more eaten by the poor, as they can be eaten after plain " broiling. All fish are in their best condition at the time of " the ripening of the mill and roe; they are fatter, and have a " better flavour." Eggs contain about 26 per cent. of solid matter, of which 14 per cent. is nitrogenous and 10½ carbonaceous, or fatty; the *yolk* contains the fat, while the white is richest in nitrogen. Eggs, being very deficient in carbonaceous matter, go well with fat bacon, oil in salad, and farinaceous food. " Fat in some shape is universally con- " sumed. Cocoa and chocolate owe their chief value to the fat " they contain; cocoa is composed of 50 per cent. of solid fat. " Of liquid articles of diet, beer and porter stand first in nutri- " tive value. It is estimated that for the daily supply of the " metropolis there are distributed about 4200 tons of fish, " over 4000 sheep, nearly 700 oxen, about 90 calves, 4000 " pigs (including bacon and hams), 5000 fowls, a million " oysters, and nearly a million quartern loaves." But this is guess-work.

In Dr. Letheby's second lecture he refers to the artificial means of encouraging digestion. " The functions of saliva are " to lubricate the food for deglutition, to carry oxygen into " the stomach, and to furnish a solvent for starch and tender " cellulose." It has no chemical action on fat, or fibrin, or albuminous bodies. An artificial saliva may be obtained. Liebig's extract of malt is an example of this; also Mr. Morson's *saccharated wheat phosphates*. Both of these are aids to the digestion of farinaceous food. Pepsin is artificially prepared by several persons to assist digestion, by a preparation, as it were, of gastric juice. The strongest pepsin is obtained from young healthy pigs, which are kept hungry, and are then excited by savoury food, which they are not allowed to eat; while the influence of it is strong upon them, and the secretions are pouring out in expectation of the meal, the animals are instantaneously killed by being pitted. " Pepsin, " like diastase, is rendered inert by a temperature of from " 120° to 130° Fahr., and, therefore, hot drinks after a " meal are hurtful." Yorkshire teas and hot grog after supper are equally to be avoided. Dr. Letheby extracts the tables on the comparative digestibility of various foods, prepared by Dr. Beaumont, who experimented on the Canadian with an opening into his stomach. But there must be modifying influences, the value of which it is impossible to settle. Cooking has an enormous influence on the digestibility of food. We cannot easily believe that roast mutton is less easily digested than ox-liver or than goose or beef. It seems that, of starchy substances, roast potatoes are more easily digested than boiled. Dr. Letheby sums the aids to digestion thus: First, proper selection of food, according to the taste and digestive powers of the individual; secondly, proper treatment as regards cooking, flavouring, and serving it; thirdly, proper variations of it, both as to its nature and treatment, so that the appetite may not fail; fourthly, exercise, warmth, and a genial disposition. The last condition shows that those who give elaborate dinners should take care to provide one or more amusing guests. We have said enough to draw attention to these lectures, which condense, in a popular manner, the latest scientific investigations in connexion with the subject of food.

The whole question of the management of telegraphs by our Government has been presented in a Blue-Book, which both states the case for the Post-Office and undertakes to reply to the pamphlet issued by the telegraph company chiefly affected by the Bill. We have always maintained that the weight of evidence was in favour of the transfer of the telegraph service to the Post-Office; and the suspicious fact that Mr. Edwin Chadwick supports the transfer does not alter our views. The arguments against Government manufactures or Government management of railways do not prevail in this instance. The Government has, in the Post-Office establishment, the means of working telegraphs at a profit where private companies would work at a loss, and of working at a loss where private companies would object to work at all. The District Telegraph of London is a failure for almost every useful purpurpose. In London, it is usually behind the post at twelve times the cost. In the hands of the Post-Office it would be of great value, especially in the suburbs. Mr. Scudamore, the official author of the plan, supports it by elaborate comparisons with the systems at work in Belgium and Switzerland, to which we do not attach much weight, the conditions of those countries and this being so different. It really does not require any arguments to prove that, if a telegram could be sent and delivered from every post-office for a shilling, an immense number of messages would be sent; or that, if one system without competition served all our great towns, there would be a surplus of saving and profit to devote to the use of smaller communities. The Post-Office has distributed throughout the kingdom upwards of 12,000 offices, every one of which is open daily, and at every one of which some person must be in attendance for from 10 to 12 hours of the day, and some for from 16 to 18 hours; at a few the attendance is continual. At 9000 of these offices the duties are limited to receiving, registering, and transmitting letters; the remaining 3000 have also to do money-order and savings-bank business. Thus the Post-Office has, as stock in trade and staff, 12,000 offices distributed equally with the population all over the kingdom, and a staff which, for a small extra payment, is ready and will be most willing to perform extra duties. Mr. Scudamore proposes, in the first instance, to ramify the telegraph system through all the post-offices of London and every important town of the kingdom, and also at every money-order post-office having a population of not less than 2000—to open deposit-offices at which messages may *be deposited*, and the charges thereon paid, at every post-office in the United Kingdom at which no telegraph-office is established—to allow the use of pillar boxes for messages written on stamped paper; payment for messages to be made in stamps; the charge to be a shilling (including delivery within certain distances) for twenty words. The financial part of the question offers no great difficulties; the subscribed capital of the Electric and International Company is under £1,050,000, on which the highest dividend has been 9 per cent. The capital of the British and Irish Magnetic is a little over half a million, upon which a dividend of 5 per cent. has been paid. To this must be

added half a million of borrowed capital. The United Kingdom, with a capital of £270,000, and the London District, with a capital of £60,000, pay no dividend, and exist only for the benefit of the officials; so that the capital to be provided is less than two millions and a half, which would not be formidable if doubled to provide what the shareholders and officials are entitled to—liberal payment and compensation. The majority will only be too glad to exchange their prospects of increase for Government Telegraph Stock at an equitable price, redeemable periodically with a bonus. The pamphlet in opposition to the Government plan, which bears the name of Mr. Grimston, is evidently inspired by a gentleman whose initial stands much higher up the alphabet than "G." It is written in a positively frantic spirit. Some of the arguments against are positively in favour of the Government plan, as, for instance, that the extension to small towns and villages would cause a loss. Of course it would; a loss to be paid by the profits of the monopoly of great business to great towns. There is a loss now on the delivery of letters in thinly-peopled districts. The assertion, if true, that village post masters and mistresses are now unfit to work the telegraph, only proves that employment must be found in the beginning for the existing staff of the three rival companies. In a year or two the usual results of demand will follow in supply. It is not necessary that the Government telegraph system should produce a profit, if it pays the expenses of interest, maintenance, and working. There is reason to believe that, in the Post-Office, efficiency is often sacrificed to the desire to produce a large surplus. The strong point of the Electric Company's pamphlet is the fear expressed lest the press should lose the convenience of the establishment which has been admirably organized by the company in Telegraph Street for supplying the papers with news at a penny a line. But there is nothing to prevent the business continuing as a private speculation under the present managers. As for the objection that the Government officials cannot be trusted with commercial or political telegrams, it is ridiculously absurd.

The Tunbridge Wells scheme, as planned by Mr. Lawson, for a sewage irrigation farm in the northern valley—which, after inquiry before Mr. Taylor, was approved by the Home Secretary—has been abandoned, and a compromise effected, under which the plan of Mr. Grantham and Mr. Bailey Denton has been adopted. This satisfies Mr. Goldsmid, satisfies Mr. Smith, whose estate is purchased, and leaves the other half of the sewage to be settled on another day.

In the meantime, the squabble of the River Purification Commissioners at Liverpool, between Mr. Rawlinson and Mr. Harrison, has ended in a manner not contemplated by Mr. Rawlinson. The commission has been dissolved, Mr. Rawlinson relieved of his dignity as chairman, and a new commission appointed, consisting of Sir William Denison, K.C.B., formerly a captain of engineers, governor of Van Dieman's Land, New South Wales, and last of Madras; Mr. J. Chalmers Morten, editor of the *Agricultural Gazette*, and late manager of the sewage farm at Barking; and Dr. Frankland, the eminent chemist who holds such extreme notions on the subject of the purity of water.

DR. FRANKLAND'S LECTURE ON THE PROPOSED NEW SOURCES FOR THE WATER SUPPLY OF THE METROPOLIS.

For the second time Dr. Frankland has taken advantage of his position, as Fullerian Professor of Chemistry in the Royal Institution of Great Britain, to give publicity to his very remarkable opinions on the present water supply of London, and to praise, in no measured language, the extravagant schemes which have been proposed for the supply of water to this metropolis from the slopes of the Welsh hills or from the lakes of Cumberland.

His chief objections to the present supply are, that it is costly, that it is not constant, and that the quality of the water is not sufficiently good. But, curiously enough, as regards the first objection, he actually advises that an outlay of from eleven to thirteen million pounds of public money should be made for about 250 million gallons of water daily from Wales or Cumberland, as a means of cheapening the supply. "It "quite staggers one," he says, "at first sight, to think of the "amount it is proposed to expend upon them." We quite agree with him in this, and may add, at second sight also. It so far staggered the committee of the House of Commons, when last year it was proposed to them, that they dismissed it as an impracticable measure.

His second objection is, that the present supply is not constant. But with whom lies the fault of this? The public have power, if they choose to exercise it, and may enforce a constant supply. They have only to put their pipes and other water appliances into proper order, and the companies are bound to give it them. The companies, indeed, would be only too glad to meet such a demand, provided it is made in accordance with the conditions of the Act of Parliament; for it would not only effect a considerable saving in the consumption of water, but it would also lessen the cost of its distribution.

As to the third objection—that the water is not sufficiently good for domestic purposes—Parliament has already decided, after a very searching inquiry into the subject, so lately as last year, that the water supplied to this metropolis is not only abundant, but is of excellent quality; and it is remarkable that the very water which Dr. Frankland condemns as being the worst in London, is of precisely the same composition as that which the municipal authorities of Paris have selected as the best for that city. They have even gone to a long distance —to the sources of the Dhuis—for this hard chalk water, rather than take the softer waters which are nearer home. The conclusions, indeed, which determined the question of the water supply of Paris, are the very opposite of those which Dr. Frankland is advancing. The learned French commissioners were of opinion, after a careful investigation of the subject, that a moderately hard water was best suited for the supply of a large city. Dr. Frankland thinks otherwise; and it is to be regretted that his chemical opinions are not guided by the light of physiology, which shows us that saline matter is as necessary for the sustenance of the animal body, and for the performance of its vital functions, as organic matter; and, perhaps, the chief source of certain saline substances, to wit, the calcareous salts, may be in the water we drink. It has been pertinently remarked that "four-fifths of the earth's "surface are composed of calcareous strata, which yield water "that is more or less rich in carbonate and sulphate of lime;" and it may well be that this is a wise provision for the supply of these salts to the animal system. As Mr. Johnson has truly observed in his "Chemistry of Common Life," "the "bright sparkling hard waters which gush out in frequent "springs from our chalk and other limestone rocks, are "relished to drink, not merely because they are grateful to "the eye, but because there is something exhilarating in the "excess of carbonic acid they contain and give off, as they "pass through the warm mouth and throat; and because the "lime they hold in solution removes acid matters from the "stomach, and thus acts as a grateful medicine to the system. "To abandon the use of such a water, and to drink daily in "its stead one entirely free from mineral matter, so far from "improving the health, may injure it." In fact, the water of a country may determine the diet of its inhabitants: the soft water of the lakes of Scotland, for example, may have had something to do with the choice of brown meal; and but for the calcareous waters of Ireland the potato could not have become a national food.

As to the loss of tea, which is so often attributed to the use of hard water, it was demonstrated by the Royal Chemical Commission (composed of Professors Graham, Miller and Hofmann), which was appointed in 1851 to inquire into the quality of the water supply of London, that the best flavoured infusion of tea was made from a moderately hard water; that, although soft water would extract more of the bitter constituents of tea, and produce a darker coloured solution, yet it would not dissolve more of the true physiological principles of the leaf, or improve its flavour. London water, which, when boiled for 10 or 15 minutes, is reduced to 4° or 5° of hardness, makes, in their opinion, excellent tea—equal to that produced from water of only 2⅔° of hardness. In fact, in the case of the Greenwich pensioners, very good tea was made from water of 24° of hardness before boiling, and of 18·6° after; but it was infused for half an hour, and the commissioners remark that "where any great loss of strength of tea infusion has been "observed in passing from a soft water to a harder, it may be "probably referred to the circumstance that the mode of in-"fusing it has not been properly adapted to the hard water, "and then there is doubtless some waste of tea.

In the table which Dr. Frankland has given of the comparative analyses of the Welsh, Cumberland, and London

waters, he states that the maximum amount of total solid matter (called by him total solid impurity) in the latter is 59·2 parts in 100,000 = 41·44 grains per imperial gallon; but this is surely an error, for, on looking at the monthly returns of the metropolitan waters by the Association of Medical Officers of Health, the largest amount of solid matter at any time in any of the London waters is 28·62 grains per gallon—this being the maximum amount of the Kent water in January, 1867. Can it be that this error has arisen from some such a cause as that which was discovered in the Bromley water, when Dr. Frankland reported that it contained a large excess of impurity, but which the analyses of Drs. Odling, Letheby, and Williamson (made at the request of the inhabitants of Bromley, the Kent Water Company, and the Local Board of Health) showed to be incorrect, the water being of excellent quality?

We have more than once exposed the fallacy of Dr. Frankland's opinion as to the supposed previous sewage contamination of water, and we did hope that he had abandoned his hypothesis, and that he would no longer express the facts of chemical analysis, or describe the quality of a water in such questionable language. Seeing also that he is writing for the information of the English public, it would, we think, be more intelligible to them if he expressed his results in common English weights and measures, rather than in hundreds of thousands of parts; finding, for example, that a gallon of water contained 0·0021 of a grain of ammonia, 0·0175 of a grain of organic nitrogen, and 0·2261 of a grain of nitrogen in the form of nitrites or nitrates, it would unquestionably be more truthful, more explicit, and more scientific so to represent the fact, than to say that 100,000 lbs. of the water had received a previous contamination from 2930 lbs. of sewage. Dr. Farr, indeed, goes beyond this, and expresses the analytical results in tons. Nor is it candid, or correct, to say "that each glass of Thames water taken from the river "by the companies contains a teaspoonful of sewage;" for such a statement requires and is followed by an elaborate explanation to show what it means, and when it is understood it is found to be a mere figure of speech, and therefore a needless cause of alarm. We have always protested against this sensational style of language, and we are bound to say that in our opinion it is most unbecoming on the part of those who occupy official positions; for not only do such remarks acquire additional importance because of that official position, and therefore generally pass unchallenged, but also because they are not in accordance with the wholesome rule which should always be observed by public officers—namely, to express themselves in the most truthful, the most clear, the most temperate, and the most matter-of-fact language.

We have not ventured in these observations to question the reliability of Dr. Frankland's new process for the estimation of nitrogen, but we believe that it requires to be carefully examined before it can be so accepted. It appears, indeed, to be open to so many serious sources of error that we doubt whether even the basis of the hypothesis of previous sewage contamination may not be a delusion, and we shall return to this subject ere long.

Circular to Gas Companies.

The committee on the Metropolis Gas Bills met *pro formâ* on the 23rd inst. to take appearances, and then adjourned to Thursday next, when, as at present arranged, the Bill of the Corporation of London will be first proceeded with. Messrs. Wyatt and Metcalf appeared as agents, and Mr. Pope as counsel for the promoters of Mr. Morrison's Bill, but the names of the real promoters of it did not transpire, and as the Metropolitan Board of Works and the vestries of Marylebone and Clerkenwell, and probably some other vestries, are taking measuers to oppose the Bill, it is of some importance to know by whom it is promoted. At an ordinary weekly meeting of the Metropolitan Board, on the 17th inst., it was agreed to present a petition against the Bill, several clauses of which were objected to. In addition to that petition to the House of Commons, it was thought desirable that the counsel appointed to oppose the Bill before the committee should be instructed to state the objections more particularly, and be prepared with clauses to be introduced into that portion of it which provides for the purchase of the undertakings of the gas companies. A special meeting of the Board was accordingly convened, to be held on Saturday last, immediately after the rising of the previously appointed committee of the whole Board on metropolis gas. The resolutions adopted by the committee were to the effect, that the Bill was adverse to the interests of the consumers of gas and the ratepayers, since it sanctioned the claims of the companies to dividends of 10 per cent. on their capitals; that it provided for an annual revision of the price and illuminating power, so as to maintain that rate of dividend; that the clauses which provided for the purchase of the undertakings were impracticable and inefficient; and that it was unjust to charge the Metropolitan Board not only with the costs of passing the Act, but with the expenses incurred last year. Appended to the resolutions were twenty-six new clauses for regulating the purchase of the gas-works, should Parliament adopt that part of the Bill. The main objects of the clauses are, to extend the time allowed for compulsory purchase to five years instead of three; to provide for the settlement of any disagreement as to price, either by bringing into operation the Lands Clauses Consolidation Act, or by commissioners to be appointed by the Board of Trade; to give the Metropolitan Board power to borrow money for the purchase of the undertakings, and to provide generally for carrying into effect the purchase of the works of the existing companies and the supply of gas by the Metropolitan Board; that part of the Bill, as it at present stands, being so incomplete as to suggest the idea that it was not intended by the promoters to be brought into operation. The last clause of the series is very significant of the disinclination of the Metropolitan Board to be bound by the conditions for the benefit of the consumers of gas which they think it necessary should be imposed on the gas companies. It provides that, "in the event of the purchase of the under-"takings of the company the subsequent clauses of this "Act shall cease to operate, but without prejudice to any-"thing done under those provisions previous to such pur-"chase." Besides the introduction into the Bill of those new clauses, the committee of the whole Board proposed to omit the four clauses relating to the periodical revision of the price and illuminating power, and also the last clause respecting the expenses of the Act. The special meeting of the Board, convened to consider these proposed amendments of Mr. Morrison's Bill, was but thinly attended. The adoption of the resolutions of the committee was moved by Mr. Newton, who spoke strongly against the proposed revision of price and illuminating power, which, he said, would throw the gas consumers entirely into the hands of the gas companies, who, by the evidence of their numerous engineers, would be able to induce the commissioners to fix a price and an illuminating power more adverse to the public than the present, and that it would be better to trust to the operation of the Metropolis Gas Act of 1860 for a reduction of price than to depend on an annual revision. An amendment was moved by Mr. S. Taylor to the effect that it would be advisable to postpone the consideration of the supply of gas to the metropolis for another year. In the discussion that arose on the question, Mr. Brushfield very ably defended the gas companies from the charges made against them, and contended that, but for the expense and annoyance to which they had been subjected by vexatious agitation, the consumers of gas would now be enjoying the advantages proposed to be gained by the Bill. The amendment was rejected, four members only voting in its favour, and the resolutions of the committee of the whole Board were then carried by a small majority, ten voting for and eight against them. The objectors to the revising clauses of the Bill seem to overlook the rule given in the 71st clause for the guidance of the commissioners—that they shall not fix, in any case, an illuminating power lower nor a price higher than is prescribed by the Metropolis Gas Act; it would be impossible therefore for the gas consumers to be delivered entirely to the mercy of the commissioners, as Mr. Newton conceived would be the effect of those clauses. He may be correct, indeed, in the supposition that the price of 3s. 9d. per 1000 feet for 16-candle gas would not be maintained for more than a year, for those figures were adopted by Mr. Cardwell's committee last session merely on the principle of "splitting the difference" between the concessions made by the gas companies and the demands of their opponents. It has been asserted that the supply of 16-candle gas at 3s. 9d., instead of gas at the present standard of 12 candles at 4s., would make a difference of at least 1s. 1d. per 1000 feet—that is to say, 10d. for the

cost of 4 additional candles of illuminating power, and 3d. in the loss of price; and experience during the past year of reduced prices presents no hope that that difference can be compensated by any improvements in manufacture, distribution, or management. It should be borne in mind that the demands for a reduction of the price and an increase of illuminating power in the metropolis were based on propositions the injustice of which has been admitted, and on calculations which have been proved to be fallacious, Mr. Cardwell's committee last session having repudiated the propositions to confiscate the property of the companies by restricting the payment of dividends to only two-thirds of their capitals, and the calculation of the great saving to be effected by diminished leakage having been shown to be founded on ignorance of facts. Recent experience of the Manchester model Corporation gas management has also proved that it is impracticable, with the increased cost of materials and labour, to maintain the former profits with present prices; nor has any trustworthy evidence been adduced to show that the London gas companies can by any proposed arrangement reduce their present prices, and at the same time increase the illuminating power of the gas, without diminishing the incomes of the shareholders. An amalgamation of the thirteen metropolitan gas companies into one great company might effect some economy in the management and distribution, but it is not on that account alone that we have more than once recommended such a "fusion" of the interests of the companies. We believe it would be attended with many other advantages, not the least important of which would be the final settlement of the question, and the saving of enormous wasteful expenditure in parliamentary contests. It might perhaps facilitate the solution of the difficulty, were it provided that all the profits of the amalgamated company exceeding the prescribed rates should be paid to the Metropolitan Board of Works for public improvements, in which case a seat in the direction might appropriately be placed at the disposal of the Board. Whatever arrangements be made, it is most essential that they should be of a fixed character, so as to put an end to the vexatious and costly perennial agitation of the question of the gas supply of London, which not only unsettles the value of gas property, but is a serious injury to the consumers of gas, by preventing the companies from reducing the price, as they are bound to do when their profits exceed the prescribed rate they are allowed to divide.

The majority of the provincial gas Bills of the session are passing through the committees without much opposition. The Chichester Bill was opposed by the Corporation on the ground that there is no structural value corresponding with the proposed capital of £30,000. It appeared that by a succession of sales from owner to owner of the works, the original capital of £6000 had been inflated first to £9050, next to £14,800, and lastly to £20,750, without material addition; Mr. Church, the present owner, having agreed to sell the works for the last-named sum, to form a company. The maximum price named in the Bill as it came before the committee was 5s. per 1000 feet for 14-candle gas, and the Corporation required either that the price should be reduced to 4s. 6d., or that the capital should be fixed at a proper amount, so that there might be a prospect of reduction of price by the operation of the Gas-Works Clauses Act. Mr. Barlow, who was called as a witness by the opponents of the Bill, stated that 4s. 6d. per 1000 feet would, at the present rate of consumption, give 5 per cent. on a capital of £18,000; and the committee agreed to pass the preamble of the Bill on the condition that the capital be limited to that amount, the maximum price of gas being fixed at 5s. That decision was not, however, satisfactory to the opponents of the Bill, who declined to discuss its clauses, reserving further opposition for the House of Lords. In the case of the Worthing Bill, a neighbouring landowner objected to the compulsory power sought for to take a portion of her land; but the committee granted the power required to the extent of one acre, which is sufficient for their purpose.

An arbitration under the Lands Clauses Consolidation Act has recently taken place at Great Grimsby, before the undersheriff of the county of Lincoln and a special jury, to determine the value of six acres of land belonging to the Corporation, taken by the Grimsby Gas Company, under the powers of their recent Act, for the erection of new works. The sum claimed was £6534, and the jury awarded £2277.

We are glad to perceive, from proceedings in the Rolls Court, that there is great probability of an amicable settlement of the disputes between the Slough Gas Company and the owners of premises in the neighbourhood of the works, who complain of nuisance from the manufacture of gas. Application was made to the court, on behalf of the company, to allow their petition for winding-up the affairs of the company to stand over for a while, as an arrangement was likely to be made with Mr. Tilly, who recently obtained a verdict against them, with £300 damages, and with the other owners of property, to prevent the necessity of proceeding further with the petition. It appears from the allegations in the company's petition that their affairs are indeed in a deplorable condition. It states that they owe £800 on a bond, £1150 on various debentures, that they are indebted to their bankers £410, and to other creditors to the amount of £900, and that the property of the company is not of a total value equal to those debts, together with the amount of the verdict and costs of the late action, and that ten other similar actions for nuisance have been brought against them or are threatened. We understand that the proposed terms of settlement include the conditions that the works shall be removed to another site within five years, and that in the meantime they shall be carried on under the inspection of an engineer to be named by the judgment creditor, but paid by the company. It would be to the interest of all the parties concerned—not forgetting the public inconvenience that would arise from stopping the supply of gas—that some such arrangement should be effected, to enable the company to continue their operations.

The Folkestone Local Board have, on further consideration, recoiled from their offer to fix a meter to every alternate lamp, being deterred from so doing by the heavy expenditure of providing so many new columns and meters. They have finally resolved, after deliberating on the matter for eighteen months, to have a meter fixed to one lamp in twelve, with a self-acting pressure-regulator attached to every one, as prescribed by the Folkestone Gas Act of 1866. They have thus, at last, adopted the plan proposed by the gas company, and have discarded the double tap, to which they were inclined until very lately to attach much importance.

A communication received from the parliamentary agents of the new Neath Gas Company informs us that we were in error in stating that there had been an omission to insert in the preliminary notice of their intention to apply to Parliament for an Act of Incorporation, that they should require power to purchase and manufacture gas on the works of the existing company. A notice to that effect was, in point of fact, given, and a clause to carry it into operation was inserted in the Bill We were misled by a statement to the contrary in the course of the proceedings on the arbitration for determining the value of the old company's works, which statement was not contradicted. The prospects of the new company are, therefore, more cheering than was represented; and, if they can dispose of their shares, and can make a satisfactory arrangement with their contractors for the relinquishment of the contract for the erection of new works, the company may be able to pay moderate dividends.

Communicated Article.

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EXPERIMENTS ON THE FLOW OF GAS IN LONG PIPES,

MADE IN THE WORKS OF THE PARIS GAS COMPANY

By M. Arson, Engineer of the Company,

Assisted by

MM. Monard and Honoré.

TRANSLATED EXPRESSLY FOR THIS JOURNAL

By Dr. Pole, F.R.S., Mem. Inst. C.E.

(*Continued from page* 264.)

Diameter = $0^{m}\cdot270$. *Section* = $0^{m2}\cdot057256$. *Coefficient* a = $0^{m}\cdot000215$. *Coefficient* b = $0^{m}\cdot000350$.

Volumes Discharged in Cubic Mètres. Per Second.	Per Hour.	Volumes in English Feet per Second.	Mean Velocities in Mètres per Second.	Loss of Pressure for 1000 Mètres long, expressed in Mètres of Water. Air.	Gas.
0·005 ..	18 ..	0·176 ..	0·087 ..	0·0004 ..	0·0001
0·010 ..	36 ..	0·353 ..	0·174 ..	0·0009 ..	0·0004
0·015 ..	54 ..	0·530 ..	0·262 ..	0·0014 ..	0·0006
0·020 ..	72 ..	0·706 ..	0·349 ..	0·0022 ..	0·0009
0·025 ..	90 ..	0·883 ..	0·436 ..	0·0030 ..	0·0012
0·030 ..	108 ..	1·059 ..	0·524 ..	0·0040 ..	0·0016

Volumes Discharged in Cubic Mètres. Per Second.	Per Hour.	Volumes in English Feet per Second.	Mean Velocities in Mètres per Second.	Loss of Pressure for 1000 Mèters long, expressed in Mètres of Water. Air.	Gas.
0·035	126	1·236	0·611	0·0050	0·0020
0·040	144	1·413	0·698	0·0061	0·0025
0·045	162	1·589	0·786	0·0073	0·0030
0·050	180	1·766	0·873	0·0087	0·0035
0·055	198	1·942	0·960	0·0101	0·0041
0·060	216	2·119	1·048	0·0117	0·0048
0·065	234	2·296	1·135	0·0133	0·0054
0·070	252	2·472	1·222	0·0155	0·0063
0·075	270	2·649	1·310	0·0168	0·0069
0·080	288	2·825	1·397	0·0193	0·0079
0·085	306	3·002	1·484	0·0208	0·0086
0·090	324	3·179	1·572	0·0230	0·0094
0·095	342	3·355	1·659	0·0252	0·0104
0·100	360	3·532	1·746	0·0276	0·0113
0·105	378	3·705	1·834	0·0300	0·0123
0·110	396	3·885	1·921	0·0326	0·0133
0·115	414	4·061	2·008	0·0352	0·0144
0·120	432	4·238	2·096	0·0379	0·0155
0·125	450	4·415	2·183	0·0408	0·0168
0·130	468	4·591	2·270	0·0438	0·0180
0·135	486	4·768	2·357	0·0469	0·0192
0·140	504	4·944	2·445	0·0500	0·0205
0·145	522	5·121	2·532	0·0533	0·0217
0·150	540	5·298	2·620	0·0566	0·0233
0·155	558	5·474	2·707	0·0602	0·0247
0·160	576	5·651	2·794	0·0637	0·0261
0·165	594	5·827	2·881	0·0674	0·0276
0·170	612	6·004	2·969	0·0711	0·0291
0·175	630	6·181	3·056	0·0751	0·0308
0·180	648	6·357	3·144	0·0790	0·0323
0·185	666	6·534	3·231	0·0831	0·0340
0·190	684	6·710	3·318	0·0873	0·0357
0·195	702	6·887	3·406	0·0917	0·0376
0·200	720	7·084	3·493	0·0960	0·0393
0·210	756	7·417	3·667	0·1051	0·0431
0·220	792	7·770	3·842	0·1146	0·0470
0·230	828	8·123	4·017	0·1245	0·0510
0·240	864	8·476	4·191	0·1351	0·0554
0·250	900	8·829	4·366	0·1456	0·0596
0·260	936	9·183	4·541	0·1566	0·0642
0·270	972	9·536	4·715	0·1682	0·0690
0·280	1008	9·889	4·889	0·1801	0·0738
0·290	1044	10·242	5·065	0·1926	0·0790
0·300	1080	10·595	5·239	0·2054	0·0842
0·350	1260	12·361	6·112	0·2753	0·1128
0·400	1440	14·127	6·986	0·3556	0·1458
0·450	1620	15·893	7·859	0·4460	0·1829
0·500	1800	17·659	8·732	0·5466	0·2241

Diameter = 0m·300. *Section* = 0m2·70686. *Coefficient* a = 0m·000180. *Coefficient* b = 0m·000332.

0·010	36	0·353	0·141	0·0004	0·0001
0·015	54	0·530	0·212	0·0009	0·0004
0·020	72	0·706	0·283	0·0013	0·0005
0·025	90	0·883	0·353	0·0018	0·0007
0·030	108	1·059	0·424	0·0023	0·0009
0·035	126	1·236	0·495	0·0029	0·0012
0·040	144	1·413	0·565	0·0036	0·0015
0·045	162	1·589	0·636	0·0042	0·0017
0·050	180	1·766	0·707	0·0050	0·0020
0·055	198	1·942	0·778	0·0058	0·0024
0·060	216	2·119	0·849	0·0067	0·0027
0·065	234	2·296	0·919	0·0076	0·0031
0·070	252	2·472	0·990	0·0086	0·0035
0·075	270	2·649	1·061	0·0097	0·0039
0·080	288	2·825	1·131	0·0108	0·0044
0·085	306	3·002	1·202	0·0120	0·0049
0·090	324	3·179	1·273	0·0132	0·0054
0·095	342	3·355	1·344	0·0144	0·0059
0·100	360	3·532	1·414	0·0157	0·0064
0·105	378	3·705	1·485	0·0171	0·0070
0·110	396	3·885	1·556	0·0186	0·0076
0·115	414	4·061	1·627	0·0201	0·0082
0·120	432	4·238	1·697	0·0216	0·0088
0·125	450	4·415	1·768	0·0233	0·0095
0·130	468	4·591	1·839	0·0250	0·0102
0·135	486	4·768	1·910	0·0267	0·0109
0·140	504	4·944	1·980	0·0285	0·0117
0·145	522	5·121	2·051	0·0303	0·0124
0·150	540	5·298	2·122	0·0322	0·0132
0·155	558	5·474	2·192	0·0342	0·0140
0·160	576	5·651	2·263	0·0362	0·0148
0·165	594	5·827	2·334	0·0383	0·0157
0·170	612	6·004	2·405	0·0404	0·0165
0·175	630	6·181	2·475	0·0426	0·0175
0·180	648	6·357	2·546	0·0448	0·0183
0·185	666	6·534	2·617	0·0471	0·0193
0·190	684	6·710	2·688	0·0495	0·0203
0·195	702	6·887	2·758	0·0519	0·0212
0·200	720	7·064	2·829	0·0543	0·0222
0·210	756	7·417	2·970	0·0595	0·0244
0·220	792	7·770	3·112	0·0648	0·0265
0·230	828	8·123	3·254	0·0704	0·0288
0·240	864	8·476	3·394	0·0761	0·0312
0·250	900	8·829	3·536	0·0819	0·0335
0·260	936	9·183	3·678	0·0885	0·0363
0·270	972	9·536	3·820	0·0949	0·0389
0·280	1008	9·889	3·960	0·1016	0·0416
0·290	1044	10·242	4·102	0·1084	0·0444
0·300	1080	10·595	4·244	0·1157	0·0474
0·400	1440	14·127	5·658	0·1998	0·0819
0·450	1620	15·893	6·360	0·2501	0·1025
0·500	1800	17·659	7·073	0·3069	0·1258
0·550	1980	19·425	7·780	0·3691	0·1513
0·600	2160	21·191	8·488	0·4370	0·1791

Diameter = 0m 325. *Section* = 0m2·082958. *Coefficient* a = 0m·000151. *Coefficient* b = 0m·000326.

0·010	36	0·353	0·120	0·0003	0·0001
0·020	72	0·706	0·241	0.0009	0·0003
0·030	108	1·059	0·361	0·0015	0·0006
0·040	144	1·413	0·482	0·0024	0·0010
0·050	180	1·766	0·602	0·0033	0·0013
0·060	216	2·119	0·723	0·0045	0·0018
0·070	252	2·472	0·844	0·0057	0·0023
0·080	288	2·825	0·964	0·0072	0·0029
0·090	324	3·179	1·085	0·0087	0·0036
0·100	360	3·532	1·205	0·0104	0·0042
0·110	396	3·885	1·326	0·0122	0·0050
0·120	432	4·238	1·446	0·0143	0·0058
0·130	468	4·591	1·567	0·0165	0·0067
0·140	504	4·944	1·687	0·0189	0·0077
0·150	540	5·298	1·808	0·0213	0·0087
0·160	676	5·651	1·928	0·0240	0·0098
0·170	612	6·004	2·049	0·0267	0·0109
0·180	648	6·357	2·169	0·0297	0·0122
0·190	684	6·710	2·290	0·0327	0·0134
0·200	720	7·064	2·411	0·0360	0·0148
0·210	756	7·417	2·531	0·0393	0·0161
0·220	792	7·770	2·652	0·0429	0·0174
0·230	828	8·123	2·772	0·0466	0·0190
0·240	864	8·476	2·893	0·0502	0·0206
0·250	900	8·829	3·013	0·0544	0·0223
0·260	936	9·183	3·134	0·0586	0·0240
0·270	972	9·536	3·254	0·0628	0·0257
0·280	1008	9·889	3·374	0·0673	0·0276
0·290	1044	10·242	3·496	0·0719	0·0295
0·300	1080	10·595	3·616	0·0767	0·0314
0·310	1116	10·949	3·737	0·0815	0·0334
0·320	1152	11·302	3·856	0·0866	0·0355
0·330	1188	11·655	3·978	0·0918	0·0376
0·340	1224	12·008	4·098	0·0972	0·0398
0·350	1260	12·361	4·219	0·1026	0·0420
0·360	1296	12·714	4·338	0·1083	0·0444
0·370	1332	13·068	4·460	0·1141	0·0468
0·380	1368	13·421	4·580	0·1201	0·0492
0·390	1404	13·774	4·700	0·1261	0·0517
0·400	1440	14·127	4·821	0·1324	0·0543
0·410	1476	14·480	4·942	0·1388	0·0569
0·420	1512	14·834	5·063	0·1454	0·0596
0·430	1548	15·187	5·183	0·1521	0·0624
0·440	1584	15·540	5·304	0·1590	0·0652
0·450	1620	15·893	5·424	0·1659	0·0680
0·460	1656	16·246	5·545	0·1731	0·0709
0·470	1692	16·599	5·665	0·1804	0·0737
0·480	1728	16·953	5·786	0·1879	0·0770
0·490	1764	17·306	5·906	0·1955	0·0801
0·500	1800	17·659	6·027	0·2033	0·0833
0·550	1980	19·425	6·630	0·2444	0·1002
0·600	2160	21·191	7·232	0·2892	0·1082
0·650	2340	22·957	7·835	0·3380	0·1385
0·700	2520	24·723	8·438	0·3904	0·1600

Diameter = 0m·350. *Section* = 0mq·096211. *Coefficient* a = 0·000125. *Coefficient* b = 0·000310.

0·010	36	0·353	0·104	0·0002	0·0001
0·020	72	0·706	0·208	0·0005	0·0002
0·030	108	1·059	0·312	0·0009	0·0004
0·040	144	1·413	0·416	0·0015	0·0006
0·050	180	1·766	0·520	0·0022	0·0009
0·060	216	2·119	0·623	0·0029	0·0012
0·070	252	2·472	0·727	0·0037	0·0015
0·080	288	2·825	0·831	0·0046	0·0019
0·090	324	3·179	0·935	0·0056	0·0023
0·100	360	3·532	1·039	0·0068	0·0028
0·110	396	3·885	1·143	0·0081	0·0033
0·120	432	4·238	1·247	0·0094	0·0038
0·130	468	4·591	1·351	0·0108	0·0044
0·140	504	4·944	1·455	0·0123	0·0051
0·150	540	5·298	1·559	0·0140	0·0057
0·160	676	5·651	1·663	0·0157	0·0064
0·170	612	6·004	1·767	0·0175	0·0072
0·180	648	6·357	1·871	0·0194	0·0080
0·190	684	6·710	1·975	0·0214	0·0088
0·200	720	7·064	2·078	0·0235	0·0096
0·210	756	7·417	2·182	0·0257	0·0105
0·220	792	7·770	2·286	0·0281	0·0115
0·230	828	8·123	2·390	0·0305	0·0125
0·240	864	8·476	2·494	0·0330	0·0135
0·250	900	8·829	2·598	0·0357	0·0147
0·260	936	9·183	2·702	0·0384	0·0158
0·270	972	9·536	2·806	0·0413	0·0169

Volumes Discharged in Cubic Mètres. Per Second.	Per Hour.	Volumes in English Feet per Second.	Mean Velocities in Mètres per Second.	Loss of Pressure for 1000 Mètres long, expressed in Mètres of Water. Air.	Gas.
0·280	1008	9·889	2·910	0·0442	0·0181
0·290	1044	10·242	3·014	0·0472	0·0193
0·300	1080	10·595	3·118	0·0503	0·0207
0·320	1152	11·302	3·325	0·0568	0·0233
0·340	1224	12·008	3·533	0·0637	0·0261
0·360	1266	12·714	3·742	0·0711	0·0291
0·380	1368	13·421	3·950	0·0788	0·0323
0·400	1440	14·127	4·157	0·0869	0·0356
0·420	1512	14·834	4·364	0·0954	0·0391
0·440	1584	15·540	4·572	0·1043	0·0427
0·460	1656	16·246	4·780	0·1137	0·0466
0·480	1728	16·953	4·988	0·1227	0·0503
0·500	1800	17·659	5·197	0·1335	0·0547
0·520	1872	18·365	5·404	0·1435	0·0588
0·540	1944	19·072	5·612	0·1549	0·0635
0·560	2016	19·778	5·820	0·1662	0·0681
0·580	2088	20·484	6·028	0·1779	0·0729
0·600	2160	21·191	6·236	0·1894	0·0776
0·620	2232	21·897	6·444	0·2025	0·0830
0·640	2304	22·604	6·650	0·2153	0·0882
0·660	2376	23·310	6·860	0·2287	0·0938
0·680	2448	24·016	7·066	0·2425	0·0994
0·700	2520	24·723	7·275	0·2565	0·1051
0·800	2880	28·254	8·314	0·3327	0·1364
0·900	3240	31·786	9·350	0·4189	0·1717
1·000	3600	35·318	10·394	0·5152	0·2112
1·100	3960	38·850	11·430	0·6214	0·2547

Diameter = 0^{m}·400. *Section* = 0^{mq}·125664. *Coefficient* a = 0·000075. *Coefficient* b = 0·000280.

0·020	72	0·706	0·159	0·0002	0·0001
0·040	144	1·412	0·318	0·0007	0·0003
0·060	216	2·119	0·477	0·0013	0·0005
0·080	288	2·825	0·636	0·0020	0·0008
0·100	360	3·532	0·795	0·0030	0·0012
0·120	432	4·238	0·955	0·0042	0·0017
0·140	504	4·944	1·114	0·0055	0·0022
0·160	576	5·651	1·273	0·0069	0·0028
0·180	648	6·357	1·432	0·0086	0·0035
0·200	720	7·064	1·591	0·0104	0·0042
0·220	792	7·770	1·750	0·0124	0·0051
0·240	874	8·476	1·909	0·0148	0·0060
0·260	936	9·183	2·069	0·0171	0·0070
0·280	1008	9·889	2·228	0·0198	0·0081
0·300	1080	10·595	2·387	0·0227	0·0093
0·320	1152	11·302	2·546	0·0257	0·0105
0·340	1224	12·008	2·705	0·0289	0·0119
0·360	1296	12·714	2·864	0·0322	0·0132
0·380	1368	13·421	3·024	0·0356	0·0146
0·400	1440	14·127	3·183	0·0391	0·0160
0·420	1512	14·834	3·342	0·0434	0·0178
0·440	1584	15·540	3·501	0·0475	0·0195
0·460	1656	16·246	3·660	0·0512	0·0210
0·480	1728	16·953	3·819	0·0562	0·0230
0·500	1800	17·659	3·979	0·0608	0·0249
0·520	1872	18·365	4·138	0·0656	0·0269
0·540	1944	19·072	4·297	0·0705	0·0289
0·560	2016	19·778	4·456	0·0756	0·0310
0·580	2088	20·484	4·615	0·0808	0·0331
0·600	2160	21·191	4·774	0·0868	0·0355
0·620	2232	21·897	4·934	0·0924	0·0379
0·640	2304	22·604	5·093	0·0984	0·0403
0·660	2376	23·310	5·252	0·1045	0·0428
0·680	2448	24·016	5·411	0·1106	0·0453
0·700	2520	24·723	5·570	0·1169	0·0479
0·720	2592	25·429	5·729	0·1237	0·0507
0·740	2664	26·135	5·888	0·1304	0·0534
0·760	2736	26·842	6·048	0·1375	0·0563
0·780	2808	27·548	6·207	0·1447	0·0593
0·800	2880	28·254	6·366	0·1520	0·0623
0·820	2952	28·961	6·525	0·1594	0·0653
0·840	3024	29·667	6·684	0·1673	0·0686
0·860	3096	30·374	6·843	0·1753	0·0718
0·880	3168	31·080	7·003	0·1833	0·0751
0·900	3240	31·786	7·162	0·1915	0·0785
0·920	3312	32·493	7·321	0·2000	0·0820
0·940	3384	33·199	7·480	0·2086	0·0855
0·960	3456	33·905	7·639	0·2174	0·0891
0·980	3528	34·612	7·798	0·2264	0·0928
1·000	3600	35·318	7·957	0·2356	0·0966
1·100	3960	38·850	8·750	0·2841	0·1164
1·200	4320	42·382	9·548	0·3374	0·1383
1·300	4680	45·914	10·346	0·3953	0·1620
1·400	5040	49·445	11·140	0·4575	0·1875

Diameter = 0^{m}·500. *Section* = 0^{mq}·196350. *Coefficient* a = 0·000020. *Coefficient* b = 0·000246.

0·025	90	0·883	0·127	0·00006	0·00002
0·050	180	1·766	0·254	0·0002	0·00008
0·075	270	2·649	0·382	0·0004	0·00018
0·100	360	3·532	0·509	0·0007	0·0003
0·125	450	4·415	0·636	0·0011	0·0004
0·150	540	5·298	0·764	0·0016	0·0006
0·175	630	6·181	0·891	0·0022	0·0009
0·200	720	7·064	1·018	0·0028	0·0011
0·225	810	7·946	1·146	0·0035	0·0014
0·250	900	8·829	1·273	0·0043	0·0018
0·275	990	9·712	1·400	0·0052	0·0021
0·300	1080	10·595	1·528	0·0062	0·0025
0·325	1170	11·478	1·655	0·0072	0·0030
0·350	1260	12·361	1·782	0·0084	0·0034
0·370	1350	13·244	1·909	0·0096	0·0039
0·400	1440	14·127	2·037	0·0109	0·0045
0·425	1530	15·010	2·164	0·0123	0·0050
0·450	1620	15·893	2·292	0·0138	0·0056
0·475	1710	16·776	2·419	0·0153	0·0063
0·500	1800	17·659	2·546	0·0169	0·0069
0·525	1890	18·522	2·673	0·0187	0·0076
0·550	1980	19·425	2·801	0·0205	0·0084
0·575	2070	20·308	2·928	0·0223	0·0091
0·600	2160	21·191	3·055	0·0243	0·0099
0·625	2250	22·074	3·183	0·0263	0·0108
0·650	2340	22·957	3·310	0·0285	0·0117
0·675	2430	23·840	3·438	0·0307	0·0126
0·700	2520	24·723	3·565	0·0330	0·0135
0·725	2610	25·606	3·692	0·0353	0·0145
0·750	2700	26·489	3·819	0·0378	0·0155
0·775	2790	27·372	3·947	0·0403	0·0165
0·800	2880	28·254	4·074	0·0429	0·0176
0·825	2970	29·137	4·202	0·0456	0·0187
0·850	3060	30·020	4·329	0·0484	0·0198
0·875	3150	30·903	4·456	0·0513	0·0210
0·900	3210	31·786	4·584	0·0542	0·0222
0·925	3330	32·669	4·711	0·0573	0·0235
0·950	3420	33·552	4·838	0·0604	0·0247
0·975	3510	34·435	4·965	0·0636	0·0261
1·000	3600	35·318	5·093	0·0669	0·0274
1·025	3690	36·201	5·220	0·0702	0·0288
1·050	3780	37·084	5·347	0·0737	0·0302
1·075	3870	37·967	5·474	0·0772	0·0316
1·100	3960	38·850	5·602	0·0808	0·0331
1·125	4050	39·732	5·729	0·0844	0·0346
1·150	4140	40·616	5·857	0·0882	0·0361
1·175	4230	41·499	5·984	0·0921	0·0377
1·200	4320	42·382	6·111	0·0961	0·0393
1·225	4410	43·265	6·239	0·1000	0·0410
1·250	4500	44·148	6·366	0·1040	0·0427
1·300	4680	45·914	6·620	0·1124	0·0461
1·400	5040	49·445	7·130	0·1302	0·0534
1·500	5400	52·978	7·639	0·1497	0·0614
1·600	5760	56·509	8·148	0·1702	0·0698

Diameter = 0^{m}·600. *Section* = 0^{mq}·282744. *Coefficient* a = 0. *Coefficient* b = 0·000220.

0·025	90	0·883	0·088	0·00001	0·000006
0·050	180	1·766	0·177	0·00006	0·000024
0·075	270	2·649	0·265	0·00013	0·000054
0·100	360	3·532	0·353	0·0002	0·000096
0·125	450	4·415	0·442	0·0003	0·00015
0·150	540	5·298	0·530	0·0005	0·00022
0·175	630	6·181	0·618	0·0007	0·00029
0·200	720	7·064	0·707	0·0009	0·00038
0·225	810	7·946	0·795	0·0012	0·00049
0·250	900	8·829	0·884	0·0014	0·0006
0·275	990	9·712	0·972	0·0018	0·0007
0·300	1080	10·595	1·061	0·0021	0·0009
0·325	1170	11·478	1·149	0·0025	0·0010
0·350	1260	12·361	1·237	0·0029	0·0012
0·375	1350	13·244	1·326	0·0033	0·0013
0·400	1440	14·127	1·414	0·0038	0·0015
0·425	1530	15·010	1·502	0·0042	0·0017
0·450	1620	15·893	1·591	0·0048	0·0019
0·475	1710	16·776	1·679	0·0053	0·0022
0·500	1800	17·659	1·768	0·0059	0·0024
0·525	1890	18·522	1·856	0·0065	0·0026
0·550	1980	19·425	1·945	0·0072	0·0029
0·575	2270	20·308	2·033	0·0078	0·0032
0·600	2160	21·191	2·121	0·0085	0·0035
0·625	2250	22·074	2·209	0·0092	0·0038
0·650	2340	22·957	2·298	0·0100	0·0041
0·675	2430	23·840	2·386	0·0107	0·0044
0·700	2520	24·723	2·475	0·0115	0·0047
0·725	2610	25·606	2·563	0·0124	0·0051
0·750	2700	26·489	2·652	0·0133	0·0054
0·775	2790	27·372	2·740	0·0142	0·0058
0·800	2880	28·254	2·829	0·0151	0·0062
0·825	2970	29·137	2·917	0·0160	0·0066
0·850	3060	30·020	3·005	0·0170	0·0070
0·875	3150	30·903	3·094	0·0181	0·0074
0·900	3240	31·786	3·182	0·0191	0·0078
0·925	3330	32·669	3·270	0·0202	0·0083
0·950	3420	33·552	3·359	0·0213	0·0087
0·975	3510	34·435	3·447	0·0224	0·0092
1·000	3600	35·318	3·536	0·0235	0·0096
1·050	3780	37·084	3·712	0·0260	0·0106
1·100	3960	38·850	3·889	0·0284	0·0116
1·150	4140	40·616	4·066	0·0312	0·0128
1·200	4320	42·382	4·243	0·0340	0·0139
1·250	4500	44·148	4·420	0·0369	0·0151
1·300	4680	45·914	4·596	0·0399	0·0163
1·350	4860	47·679	4·773	0·0430	0·0176
1·400	5040	49·445	4·950	0·0462	0·0189
1·450	5220	51·211	5·126	0·0496	0·0203

Volumes Discharged in Cubic Mètres. Per Second.	Per Hour.	Volumes in English Feet per Second.	Mean Velocities in Mètres per Second.	Loss of Pressure for 1000 Mètres long, expressed in Mètres of Water. Air.	Gas.
1·500	5400	52·977	5·303	0·0531	0·0218
1·600	5760	56·509	5·658	0·0604	0·0247
1·700	6120	60·041	6·010	0·0680	0·0280
1·800	6480	63·573	6·364	0·0764	0·0312
1·900	6840	67·105	6·718	0·0852	0·0348
Diameter = 0m·700.		*Section* = 0mq·384846.		*Coefficient* a = 0.	
		Coefficient b = 0·000200.			
0·050	180	1·766	0·130	0·00002	0·00001
0·100	360	3·532	0·260	0·00009	0·00004
0·150	540	5·298	0·390	0·00022	0·00009
0·200	720	7·064	0·519	0·00039	0·00016
0·250	900	8·829	0·649	0·0006	0·00025
0·300	1080	10·595	0·779	0·0009	0·00036
0·350	1260	12·361	0·909	0·0012	0·0005
0·400	1440	14·127	1·038	0·0016	0·0006
0·450	1620	15·893	1·169	0·0020	0·0008
0·500	1800	17·659	1·299	0·0025	0·0010
0·550	1980	19·425	1·429	0·0030	0·0012
0·600	2160	21·191	1·558	0·0035	0·0014
0·650	2340	22·957	1·689	0·0042	0·0017
0·700	2520	24·723	1·819	0·0049	0·0020
0·750	2700	26·489	1·949	0·0056	0·0023
0·800	2880	28·254	2·076	0·0063	0·0026
0·850	3060	30·020	2·208	0·0071	0·0029
0·900	3240	31·786	2·348	0·0081	0·0033
0·950	3420	33·552	2·468	0·0089	0·0037
1·000	3600	35·318	2·598	0·0100	0·0041
1·050	3780	37·084	2·728	0·0110	0·0045
1·100	3960	38·850	2·858	0·0120	0·0049
1·150	4140	40·616	2·988	0·0132	0·0054
1·200	4320	42·382	3·116	0·0143	0·0058
1·250	4500	44·148	3·248	0·0155	0·0063
1·300	4680	45·914	3·378	0·0168	0·0069
1·350	4860	47·679	3·508	0·0181	0·0074
1·400	5040	49·445	3·638	0·0194	0·0080
1·450	5220	51·211	3·767	0·0207	0·0085
1·500	5400	52·977	3·897	0·0223	0·0091
1·550	5580	54·743	4·027	0·0238	0·0097
1·600	5760	56·509	4·152	0·0253	0·0104
1·650	5940	58·275	4·287	0·0270	0·0111
1·700	6120	60·041	4·416	0·0287	0·0117
1·750	6300	61·807	4·547	0·0304	0·0124
1·800	6480	63·573	4·676	0·0322	0·0133
1·850	6660	65·339	4·807	0·0339	0·0139
1·900	6840	67·105	4·936	0·0358	0·0147
1·950	7020	68·870	5·067	0·0377	0·0154
2·000	7200	70·636	5·196	0·0397	0·0163
2·050	7380	72·402	5·327	0·0417	0·0171
2·100	7560	74·168	5·456	0·0437	0·0179
2·150	7740	75·934	5·586	0·0458	0·0188
2·200	7920	77·700	5·716	0·0480	0·0197
2·250	8100	79·466	5·846	0·0502	0·0206
2·300	8280	81·232	5·976	0·0525	0·0215
2·350	8460	82·997	6·106	0·0548	0·0224
2·400	8640	84·764	6·232	0·0571	0·0234
2·450	8820	86·530	6·366	0·0596	0·0244
2·500	9000	88·295	6·496	0·0620	0·0254
2·700	9720	95·359	7·016	0·0724	0·0296
2·900	10440	102·423	7·534	0·0838	0·0343
3·100	11160	109·486	8·054	0·0958	0·0392
3·500	12600	123·614	9·094	0·1223	6·0501

(*To be continued.*)

Correspondence.

MOSCOW GAS.

SIR,—After expending over a million sterling in lighting the city of Moscow with gas, and now that the brilliant promises held out by the promoters of the Moscow Gas Company, Limited, are likely to be but what the proverb says promises are, shareholders are beginning to look into their position and to appoint a committee of consultation, which seems very much like locking the stable door after the horse has been stolen.

I have watched the vast expenditure going on, based on the assumed correctness of reports from men interested in making them *couleur de rose;* and, though I have often been tempted to write to you, yet many of my friends said that if I did, prior to the works being fairly started, my statements would only be considered as those of a disappointed man, and would probably create a howl of invective and do no good. Many will, however, have to thank me for having privately saved them from ruin, in preventing them from placing their capital in the City of Moscow Gas Company, Limited.

In the remarks I am about to make I will state at the outset that I am in no way interested directly or indirectly in the concern, and that my only object in sending you this statement is that I think I can pave the way for a better comprehension of the true position of the company than appears to be generally understood.

It will be better to begin at the beginning, and therefore I will say that in December, 1863, the municipality of Moscow appointed a commission to receive tenders from various parties whom they invited to tender for lighting the city with gas; the municipality undertaking to give a concession to that firm which offered the greatest advantage, and it was distinctly understood that one of the tenders would be accepted. Prince Gargarine was the president of the commission.

In answer to the invitations there were eight persons or firms competing for the concession to supply the city with coal gas, one with hydrogen gas, and another with gas made from "organic matter," which, rendered into plain English, was to be made from the dried contents of the Moscow privies, and which is a hint for "Moule's Dry Earth-Closet Company," very much at their service. The last two I do not consider were ever seriously within the pale of competition, and therefore I do not allude to them further.

Now, I think most of the competitors had great cause of complaint against the Moscow municipality for acting, as I believe, very unfairly.

After they got possession of all our offers, they did not give the concession to the one most favourable, or to that which the commission recommended the Town Council to accept (and which I have reason to believe was my own), but they prepared, to the astonishment of all of us, what they called a "normal contract," by taking from each proposition all the parts favourable to themselves, and then threw the matter open again to competition!

You will see that, among those who were originally invited to compete, the names of Messrs. Goldsmid and Gregory (who eventually obtained the concession) are not there.

Myself and some others, who had originally tendered, on discovering what we considered a breach of faith, at once wrote to Prince Gargarine and the Town Council, to express our surprise and annoyance at such treatment, and to say that we retired from further competition.

It will be seen that of the eight tenders the price required for the public lamps, burning 2000 hours, varied from 60 roubles down to 27 roubles per year, or (at the average exchange of 2s. 9d. per rouble) from £8 5s. to £3 14s. 3d. per lamp; or, deducting expenses of repairing, lighting, and extinguishing, from 15s. to 6s. per 1000 cubic feet at the burner. The price to be charged to private consumers varied from 7 roubles to 5 roubles per 1000 cubic feet.

If I and some others felt mortified at the treatment by the Town Council, and retired from further competition so soon as this normal contract made its appearance, judge of the mortification of those who, still believing that the competition would be restricted to those of the original eight who announced to the Town Council that they would tender upon the conditions of the normal contract, found that other competitors, at the eleventh hour, made their appearance, and offered to carry out all its conditions, and supply the public lamps *at fourteen roubles and a half* a year, and private consumers at 5 roubles per 1000 cubic feet; *or at a net price for the public lamps of about* 2*s.* 6*d. per* 1000 *cubic feet at the burner!!*

So far as regards the Town Council of Moscow I have nothing more to say, excepting that I think they did not behave well to those who, at great expense of both money and time, went to Moscow in the depth of winter, on the faith that they would act fairly, but who, in my opinion, and in the opinion of others, failed to do so. The Moscow people certainly consider this gas business the best bargain which they have ever made with foreigners, and they are proud of their achievement.

It certainly *is* something to be proud of, to get gas to public lamps at a price which leaves a loss at the least of £1 per lamp intrinsically, and a great loss besides in having miles upon miles of unproductive mains.

I may say, in passing, that it is fallacious in the extreme to reckon upon the private lights paying such a price as will make up the loss of the public lights, as private consumers cannot be *compelled* to burn gas, nor will they unless it is cheaper than other modes of artificial illumination.

The public lamps under a concession *should* pay nearly as much as the private consumer—and not only abroad but at home should such be the case—as, though it may be stated that the public lamps pay a large sum for lighting, yet the only difference is the saving effected by receiving in one payment what can only be considered as a payment in the aggregate for a large number of small consumers, as each lamp, with its independent service, in reality is. Wherever a scale of prices is in existence, the utmost that ought to be conceded is, that the public body should be served at the lowest price charged to any private consumers; and if this were generally adopted, with average meter indication, and the lighting, extinguishing, and repairing in the hands of the Lighting Committee, it would be better for the company, better for the ratepayers, and better for the private consumer.

For a concession to be really valuable there should be such a number of public lamps, and at such a price, as that they alone would show a profit of 5 or 6 per cent. on the whole capital; and this principle seems to be the recognized one in the Brazils and other South American States, where, instead of giving 2s. 6d. per 1000 cubic feet net as at Moscow, they give at the least 10s. per 1000, or about the same as private consumers pay, and with

coal less in price than it is at Moscow; but generally in Russia the municipalities appear to require that the public lamps pay about one-half of the price they will concede to be charged to the private consumers, which certainly is extremely clever on their part. However, as in Russia, so it is in other countries too—the people will only burn gas if it be cheaper than petroleum, and the standard of relative cost by which it is tested is the value of 2½ gallons of this oil; and as petroleum will be abundant enough in Moscow, from the south of Russia, so soon as the direct railway is completed, it will be a very powerful competitor of gas, with the price even at three roubles per 1000 cubic feet.

In order that it may be seen who the original competitors were, and the terms they offered, I give a tabulated list of them, and I afterwards propose to lay before you the chief points of the concession which was granted to Messrs. Goldsmid and Gregory, to make some remarks thereon, also upon the prospectus of the City of Moscow Gas Company, Limited, on the expenditure upon the works, and on the prospects of the company.

Principal Conditions of the Tenders submitted to the Moscow Municipality for Lighting the City with Gas.

	Erlanger & Co.	Nicholson & Co.	Reidinger.	Bouquier.	Bower and Associates.	Roberts & Co.	Shilofsky & Co.	Vandermade, Stockfish, & Co.
What the gas is made from.	Coal.	Coal.	Coal.	Coal.	Coal.	Coal.	Coal.	Coal.
Term of concession.	36 years, with extension of 14 years.	30 years, to be increased in case there should arise any impediment to works.	35 years, extension of five years at a time by mutual consent.	30 years, extension 20 years.	30 years, extension 10 years.	50 years, perpetual.	To begin after 25 versts of piping be laid, and then 36 years to be accorded.	30 or 50 years, at option of municipality.
Length of mains proposed to be laid.	180 versts.	180 versts.	According to plan of the municipality.	200 or 500 versts.	According to plan submitted.	7500 lamps, distance between each not to exceed 20 fathoms.	25 versts.	250 versts.
Term for completing works.	5 years.	7 years.	4 years.	7 years.	4 years.	5 years.	From 6 to 7 versts per month.	4 years.
Price for Public lights.	2000 hours. Illuminating power 12 candles. 31 roubles.	2000 hours. Illuminating power 8 candles. 30 roubles.	2000 hours. Illuminating power 14 candles. 27 roubles.	2000 hours. Illuminating power 8 candles. 34 to 30 rbls.	2000 hours. 4½ cubic feet per hour of 12-candle gas. 27 roubles.	2000 hours. Illuminating power 12 candles. 60 roubles.	2000 hours. 35 roubles.	2000 hours. Illuminating power 12 candles. 27 roubles.
Price for private consumers per 1000 c. ft.	6 roubles.	5 roubles. Government 4 roubles.	From 6 to 5 roubles.	7 roubles.	5 roubles.	6 roubles 50 cop.	7 roubles.	From 6 to 5 roubles 10 cop.
Security.	60,000 roubles.	100,000 roubles.	150,000 roubles.	None stated.	100,000 roubles.	70,000 roubles.	None specified.	None specified.

The chief points of the concession are as follows:—

1. It is for 30 years, and the mains are to be laid within a perimeter marked on a plan, the company having power to extend them beyond that perimeter, but without exclusive privilege. Private persons are not prohibited from making their own gas, nor does the concession affect the privilege enjoyed by the Portable Gas Company.

2. The town may require an extension of pipes during the first 24 years, provided there be one public or private light for every 6 yards of pipe laid.

3. The public lamps are to burn 2000 hours, each light consuming 5 cubic feet per hour, and giving a light equal to 12 sperm candles of best English manufacture, *four* to the pound, consuming 120 grains per hour.

4. The price, including lighting, extinguishing, and repairing, was taken by Messrs. Goldsmid and Gregory at 14½ roubles per lamp, or at less than 40s. each, including lighting, extinguishing, and repairing; and the price to private consumers is NOT TO EXCEED 5 roubles per 1000 cubic feet English. These prices may be reduced if the railway authorities permit coal to be delivered loose by the St. Petersburg and Moscow Railway for one year, instead of in bags—for public lamps, 2 roubles or 5s. 6d. each; and to private consumers, about 7d. per 1000 cubic feet; also the price is to be reduced if the carriage of coal from St. Petersburg to Moscow be less than 16 copecks per pood—for every copeck, half a rouble, or say 1s. 4½d. for each public lamp, and a corresponding diminution in the price to private consumers. Examples illustrating the way in which the reduction will take place are given. Further, if the gas be made from Russian coal, or from any other substance than coal, by which a saving can be effected, the town is to share in the saving to the extent of 50 per cent. On the other hand, the price of gas may be increased if a duty be put on imported coal, if the carriage be higher than 16 copecks per pood, if the Russian ports are blockaded, thus causing an increase of price, or if other more expensive material has to be used. The town is to pay for any increased number of hours the lamps may be required to burn, at the same price as may be existing at the time.

5. The security for the proper carrying out of the work is 400,000 silver roubles, which is to be returned on completion; but after that the whole of the works are to be held as security to the town for the proper fulfilment of the contract entered into by the concessionaires, and a special injunction is given that neither the works, nor anything connected therewith, are to be mortgaged so as to prejudice the security of the town. In case the contracting parties fail in their obligations to the town, the gas-works are to pass into the hands of the municipality, to be managed by them.

6. If within three years 3000 public lamps are not lighted, then the concession becomes void, and the contractors cannot pass gas through their pipes, but one year is given for the removal of them, when, if they are not removed, the town takes possession of all that may be left. Removals of lamps to be half at the expense of the contractors and half at that of the town. If the illuminating power of the gas be found at any time to be 10 instead of 12 candles, the price of the gas is to be reduced 1 rouble 40 copecks, or about 4s. per 1000 cubic feet. If any public lamp be lighted half an hour less than the time stipulated, then the deduction is to be a fine equal to the value of the gas for one night's burning. If any lamp be unlighted, the fine to be double the above. If any new method of producing gas is discovered, the contractors are bound to adopt it at their own expense, providing it will effect a saving, and such saving is to be shared by the town as may be arranged.

7. The pipes are to be laid in such a manner as that the leakage shall not exceed 10 per cent., the town having the right to appoint engineers to see that this and any other provision of the concession is properly carried out.

8. The concessionaires have the right of importing, duty free, during a period of ten years, all material required for the gas-works, providing Moscow manufacturers cannot supply them within 15 per cent. of the cost of the imported goods. The works are to be insured, and the policy deposited with the Town Council, or, failing this, the town can do so, deducting the cost from moneys payable by the town to the contractors for lighting the public lamps.

9. The contractors are bound to keep the works in the best possible order, and to permit a legally appointed person to examine them on the part of the town, and the quantity of gas sent out by them.

10. At the expiration of the 30 years the town has the right of electing one of the following:—Either to purchase the works, to prolong the concession, or neither to purchase the works nor to extend the concession; but the town must give the contractors twelve months notice of which they intend to do. The purchase may be effected by mutual agreement, or by paying for them an amount equal to the net profit of the last ten years of the concession. If the concession be prolonged ten years further, then at the end of that period the whole of the land, plant, mains, services, public lamps, and everything excepting spare material, of which there must be seven months stock in hand, is to be handed over to the town in good and efficient working order. The spare material is to be taken by the town by valuation. If the town do not buy the works and prolong the concession, then the company can supply gas in competition and without any special privilege.

11. In case of anything happening beyond the control of the contractors (*force majeure*) during the first three years, the town

will grant a prolongation of the term during which the contractors agree to complete the works. The contractors may transfer this concession, but not until 2000 public lamps are in full operation.

Such are the chief articles of the concession under which the City of Moscow Gas Company, Limited, is lighting Moscow with gas, and I fail to discover wherein it can be called, as it has been, "the most valuable concession in Europe." On the contrary, it seems to me, as compared with some I have and many I know, to be exceedingly harsh in its conditions, both as to price of gas, the conduct of the works, and the disposal of the property at the termination of the concession.

It may be well now to turn to the prospectus of the City of Moscow Gas Company, Limited, which gave to the public the information on which shareholders chiefly subscribed for shares.

I was in Moscow at the time, or shortly after the prospectus came out, and it was the subject of general remark amongst the English community there, both as to its exaggerations and, in some respects, its untruthfulness.

The prospectus stated at the onset that "six railways converge within its walls." Men who had been living there for years knew only of four, the "Nijni Novgorod," "Riazan," "Nicholiefsky," and "Troitsa."

It stated, too, that "the nature of its climate was such as to render gas, both for lighting and warming purposes, an object of primary importance." Now, as to warming by gas, the Russians certainly know better than to do so; besides every house is, of necessity, built with provision for warming by what are called "peaches" and flues in the walls. Gas would be ten times more costly, so that *this*—the expense—would be the "object of *primary* importance with the inhabitants"—if even it were practicable, which it is not, in such a climate.

It further stated that there were 200 hotels and 4841 inns, cafés, and wine-houses, 100 police stations, 102 printing offices, and so on; also that four of the clubs paid about £250 each per month for their light, and that the Government paid annually £13,600 for lighting the opera house and the theatre.

I take from my note-book the following observations entered into it at the time I was in Moscow, as having been made partly from my own knowledge of the place, partly from information furnished by most reliable men, and partly from the manager of the Portable Gas Company, then supplying the opera house and theatre with gas.

The observations are—

Fifty per cent. of the inns and restaurants will be outside of the radius intended to be lighted with gas.

Many of the hospitals and other places named in the prospectus, it is true, *come within the limits of the city of Moscow for statistical purposes*, but are wholly without the radius of the lighting powers of the company.

I have noted also that the sum of £250 per month for lighting each of the clubs was an exaggeration; while the managing director of the Portable Gas Company declared that no such sum as £13,600 was expended for lighting the opera house and Russian theatre.

The prospectus stated there were 17,032 shops and 700 factories and workshops. This is very likely true in the sense that such might be found in the *official directory*, but these, like the other places, were very many of them outside the lighting limits, and of those that were within not a tithe of the so-called "shops" would ever burn gas, while many of the factories and large establishments made their own, or were supplied under contract for a term of years by the Portable Gas Company.

It is stated in the prospectus, too, that "Moscow has hitherto been dependent upon portable gas, candles, and petroleum oil, but the costliness of them renders any competition with ordinary gas impossible." Now, it is just the reverse, for the competition which these modes of lighting offers to ordinary gas has been such as to make the company lower their price already from 5 to 4 roubles per 1000, and it must come lower yet to keep petroleum out of competition, and for the reasons I have already stated. Further, the street-lights are stated to have to "consume 10,000 cubic feet of gas, with an illuminating power which NEED not exceed 12 candles." True, this is so; but, if the illuminating power be LESS than this, the penalty is very heavy, as will be found in one of the Abstracts from the concession. (No. 6.)

The provisional contract entered into with Smith, Knight, and Co., and afterwards transferred to another firm, was "for works capable of supplying 120,000 lights and upwards of 140 miles of mains, and the net profits were calculated to exceed 20 per cent. per annum; and in this estimate no profit whatever was 'assumed' on public lights."

Examples of other gas companies established with "exclusive privileges" were given too, but without saying what those exclusive privileges were, merely stating that 25 and 20 per cent. profits were made.

Power, too, was to be taken (since duly exercised) of "raising money on debentures, by which means the profits divisible among the shareholders may probably rise to a higher figure than that already indicated."

Then "the proprietors of the concession had *such* confidence in the complete success of the undertaking, that they agreed to transfer all their rights and *advantages* to the company, on consideration of receiving, in lieu of any present payments, one-half of the net profits of each year after 10 per cent. shall have been earned on the total paid-up capital of the company."

Now, as to the 120,000 lights paying 20 per cent. without "assuming" any profit from the public lights, I would remark that it would indeed have been folly to "assume" any profit on the public lights by supplying 10,000 cubic feet of gas as a minimum, and lighting, extinguishing, and repairing them for 40s. per light, or 2s. 6d. per 1000 cubic feet, with coal at 50s. per ton! The fact is that a loss of *at least* 20s. per lamp should be "assumed." But the "exclusive privilege" appeared to be the valuable portion of the concession, as other places with them paid 20 and 25 per cent.! but it depends upon what are the conditions of these "privileges" as to the profit which may be expected, and I fail to see any which, under the concession for lighting Moscow with gas, were more than ordinarily valuable; on the contrary, for reasons I will presently state, I cannot *see how it is possible for the company ever to pay 5 per cent. fairly earned* under such "EXclusive privileges" and INclusive conditions as are found in the concession, upon the present exorbitant capital; and if I am right—as I believe I am—then, instead of the raising money on debentures *increasing* the profit to the shareholders, it will, if it do not absorb every penny there will be to divide, at any event *materially* reduce it.

I will now give my views upon the works, which I think would have been ample to supply the city of Moscow with gas for twenty years to come, which is long enough to look ahead in gas lighting.

The maximum number of lights it would appear that it is expected ever to obtain in Moscow is 120,000, but up to the present time not many over one-fourth have been obtained. If, however, we "assume" the full quantity, then the great mistake appears to me to have been in estimating the consumption at a great deal too much—the result of inexperience, and of taking other parts of Europe as a guide; and I would observe that, in a town of 30,000 inhabitants near to Moscow, I have erected both the *gas* and *water* works at a cost of somewhat under £35,000, including working capital, and I believe they will be large enough for ten years to come. As a rule, works of one-third the size of those required in England are amply large for the interior towns of Russia.

The chairman of the company, if I am not mistaken, stated at one of their meetings that the *profit* expected on each private light was 20s. Now, my experience of gas lighting in Russia—say at Riga, Revel, and Tver—is, that it will be a large average if each of the lights fixed will *consume* 2000 cubic feet per annum; but take them at this, then the consumption from private lights would be 240 million cubic feet; and if there be 4000 public lamps, each consuming 10,000 cubic feet, there will be for them a further 40 millions, making 280 million cubic feet in all to be delivered at the burners, or about 310 million cubic feet to be produced.

Now, 240 millions, at 4 roubles, or 11s., per 1000, give £132,000; *but, before* 120,000 *lights are burning the price will have to be considerably reduced.* I will, however, "assume" this number to be obtained, and the price to be 11s. per 1000; the working expenses will be fully 70 per cent., or £76,400; and the loss must be added of £4000 on the public lamps; making £80,400 to be deducted from the £132,000, leaving a net income of £51,600 as applicable for dividend, which, on a capital of £1,036,000, raised, say, by £411,000 of 8 per cent. preference shares and debentures, and £625,000 of ordinary shares, will leave £18,700 for ordinary shareholders, from which should be deducted an amortisement-fund; so that, even with the total consumption "assumed" as possible to obtain, *but which I think highly improbable ever will be with gas at either 4 or even 3 roubles per* 1000, *where petroleum is about a rouble per gallon*, the ultimate prospect for shareholders is a 3 per cent. dividend! If, as is probable, the number of private lights will not exceed SIXTY THOUSAND *for many years to come*, then their prospect is anything but cheering.

As to the cost of the works, I went most carefully into this, based upon the consumption I thought it was probable there would be, and I could not see my way to a greater expenditure than £250,000, and to a profit greater than 12 per cent.; and my opinion still is that this was all that should ever have been expended at Moscow, and which would have provided gas-works of ample magnitude to supply the city with gas for many years to come—quite long enough for the present generation of investors in gas property.

It will be interesting to know where the million and odd pounds have been expended, under the various heads, of promotion money, expenses upon concession, preliminary expenses, brokers and financial agents' charges, interest during construction, and the amounts paid to and names of the *real* contractors.

It is a great pity that such a fine opportunity of making the Moscow Gas Company a good investment has been, as I verily believe, lost, to the great injury of all sound enterprise of the same kind.

GEORGE BOWER.

St. Neots, April 22, 1868.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

1195.—Alfred Henry Still, of Rockboro' House, Cork, and Denny Lane, of 72, South Mall, Cork, for "*Improvements in the manufacture of gas.*" April 9, 1868.

1201.—Robert Alfred Wright, of Homerton, in the co. of Middlesex, engineer, for "*Improvements in heating structures and articles, and in the mode of and apparatus for obtaining heat from petroleum and other hydrocarbons, and in apparatus for supplying air to furnaces.*" April 9, 1868.

1211.—Henri Adolphe Archereau, of 29, Boulevart St. Martin, Paris, France, chemist, for "*A new method of obtaining heat and light, and its various applications.*" April 11, 1868.

1215.—Ernest Dubois and Edward Casper, both of 101, Cannon Street, in the City of London, merchants, for "*Improvements in wet gas-meters.*" A communication. April 11, 1868.

1233.—Matthew Piers Watt Boulton, of Tew Park, in the co. of Oxford, gentleman, for "*Improvements in apparatus for receiving motion or energy from fluids and for imparting it to them, and in apparatus to be used for propulsion or in connexion therewith.*" April 14, 1868.

1237.—George Glover, of Ranelagh Road, Pimlico, in the co. of Middlesex, for "*Certain improvements in the arrangement and construction of submerged or subaqueous lamps, and in the fluid used in and adapted to such lamps.*" A communication. April 15, 1868.

1249.—Henry Sugden Evans, of the firm of Evans, Lescher, and Evans, of Bartholomew Close, in the City of London, for "*Improvements, in taps, valves, or apparatus for measuring and registering the quantity of liquid passed therethrough.*" April 16, 1868.

1250.—John Henry Johnson, of 47, Lincoln's Inn Fields, in the co. of Middlesex, gentleman, for "*Improvements in heating and ventilating, and in apparatus employed therein.*" A communication. April 16, 1868.

1252.—Henry George Fairburn, of 45, Goswell Road, E.C., in the co. of Middlesex, engineer, for "*Improvements in portable machinery for turning, screw-cutting, boring, and slotting, also for cutting off tubes or solid bars into any required lengths.*" April 17, 1868.

1279.—John Cooke, of Darlington, in the co. of Durham, mining engineer, for "*Improvements in the construction of rotary engines and pumps.*" April 20, 1868.

1283.—William Malam, of Old Kent Road, in the co. of Surrey, gas engineer, for "*Improvements in the manufacture of gas and in apparatus employed in such manufacture, part of the invention being also applicable to the manufacture of retorts, retort-casings, crucibles, and melting-pots for various useful purposes.*" April 20, 1868.

1303.—John Johnson, of Levenshulme, near the city of Manchester, millwright and engineer, for "*Improvements in metallic packings for pistons, pump-buckets, and valves.*" April 22, 1868.

1317.—Henry Hill, of the town and co. of the town of Nottingham, brassfounder and general manufacturer, for "*Improvements in water-closets and in ball and other cocks, taps, and valves.*" April 22, 1868.

1334.—Charles Brown Hardick and John Hardick, of Brooklyn, in the state of New York, U.S.A., for "*Improvements in direct-acting engines and pumps.*" April 23, 1868.

GRANTS OF PROVISIONAL PROTECTION.

176.—Edward Dorsett, of 12, London Street, in the City of London, for "*Improvements in the utilization of coal tar and the products arising from the distillation thereof, and in the apparatus employed therein.*" Feb. 18, 1868.

306.—Robert Wilson, of the city of Manchester, in the co. of Lancaster, ironmonger, for "*Improvements in the method of or means for forming connexions or joints to pipes and other articles for conveying fluids and liquids.*" Jan. 29, 1868.

504.—James Allison Hogg, of 14, Montague Street, Edinburgh, in the co. of Mid Lothian, for "*Improvements in the method of and means for increasing the combustion and illuminating power of gas.*" Feb. 15, 1868.

998.—Frederick William Crohn, of 4, Cullum Street, Fenchurch Street, in the City of London, consulting engineer, for "*Improvements in turbine apparatus for obtaining power from a fall of water.*" March 24, 1868.

1059.—Walter Watson Hughes, of 48, Porchester Terrace, in the co. of Middlesex, for "*Improvements in apparatus for propelling and steering vessels and in forcing water.*" March 27, 1868.

1082.—Andrew Barclay Walker, of Warrington, in the co. of Lancashire, brewer, for "*Improvements in the application of hot blast or heated air for evaporating salt brine and other liquids, sugar, or chemicals; also for heating gas and oil retorts, raising steam in boilers, boiling worts in breweries and distilleries; which improvements are also applicable for bleaching, tanning, and baking; likewise improvements in apparatus used in some of the aforesaid applications.*" March 30, 1868.

1094.—John Henry Weston, of Kennington Road, in the co. of Surrey, gas engineer, for "*Improvements in the means or apparatus for lighting and ventilating the interior of buildings, combining a decorative effect.*" March 31, 1868.

1122.—Augustus De Metz, of Wolverhampton, in the co. of Stafford, manufacturer, for "*Improvements in commodes or vessels to be used as water-closets, expectorating utensils, or for other purposes.*" April 3, 1868.

1131.—Jerome Valentine Jones and George James Williams, both of Birmingham, in the co. of Warwick, manufacturers, for "*Improvements in the manufacture of ornamental metallic tubes.*" April 3, 1868.

1151.—Eugene Hay, of 83, Lombard Street, in the City of London, for "*Improvements in means or apparatus for measuring and indicating the passage or flow of liquids.*" A communication. April 6, 1868.

1164.—Emile Watteau, of Vulcan Works, Middlesborough-on-Tees, in the co. of York, for "*Improvements in screw-taps, and in the mode of fixing the same.*" April 7, 1868.

1172.—Charles William Siemens, of 3, Great George Street, Westminster, in the co. of Middlesex, for "*Improvements in the application of gas-furnaces to evaporating, smelting, puddling, and other manufacturing purposes.*" April 7, 1868.

1195.—Alfred Henry Still, of Rockboro' House, Cork, and Denny Lane, of 72, South Mall, Cork, for "*Improvements in the manufacture of gas.*" April 9, 1868.

NOTICES TO PROCEED.

3415.—Edward Price, engineer and manager of the Hampton Court Company's Gas-Works, Hampton Wick, in the co. of Middlesex, for "*Improvements in apparatus for regulating the supply of gas to burners.*" Dec. 2, 1867.

3430.—John Hays Wilson, of the firm of John Hays Wilson and Co., of Liverpool, in the co. of Lancaster, brassfounders and ships ironmongers, for "*Improvements applicable to water-closets and pumps connected therewith, which latter improvements are applicable to lift-pumps generally.*" Dec. 3, 1867.

3466.—Arthur Charles Sterry, of Woodgate Cottage, Ewell, in the co. of Surrey, for "*Improvements in engines worked by heated air or gas.*" Dec. 5, 1867.

3508.—William Bradshaw Leachman, of Leeds, in the co. of York, engineer, for "*An improved rotary water or steam motive-power engine.*" Dec. 10, 1867.

3527.—John Ward, of Port Glasgow, in the co. of Renfrew, N.B., for "*Improvements in lamps to be used under water.*" Dec. 12, 1867.

3554.—Henry Atkinson, of 33, Wharf Road, City Road, in the co. of Middlesex, for "*Improvements in gas-retort ovens and furnaces.*" A communication. Dec. 14, 1867.

3587.—Ernest Marie Du Boys, of Paris, France, Government engineer, for "*Improvements in liquid-meters, or apparatus for measuring and registering the volume of water or other liquid flowing under pressure through pipes or ducts.*" Dec. 17, 1867.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

967.—Jean Isidore Darribet, "*Improvements in seats of water-closets.*" April 5, 1865.

972.—Charles Esplin, "*Improvements in apparatus for regulating the supply of gas.*" April 5, 1865.

980.—George Davies, "*Improvements in the means of and apparatus for increasing the illuminating power of hydrocarbon oils and gases.*" April 6, 1865.

1072.—Thomas Newbigging and Alexander Hindle, "*Improvements in wet gas-meters.*" April 17, 1865.

1074.—Louis de St. Céran, "*Certain improvements in gas-ammoniacal engines.*" April 17, 1865.

1076.—Joseph Dougan, "*Improvements in apparatus for distilling hydrocarbons from coals, schists, and other minerals.*" April 17, 1865.

Parliamentary Intelligence.

HOUSE OF LORDS.

THURSDAY, APRIL 23.

The Lord Chancellor acquainted the House that no further Standing Orders are applicable to the Loughborough Gas Bill.

The Clevedon Gas, and the Topsham, Woodbury, and Lympstone Water Bills, were read a first time, and referred to the Examiners.

FRIDAY, APRIL 24.

The Burslem and Tunstall Gas, and the Grand Junction Water Bills, were read a first time, and referred to the Examiners.

HOUSE OF COMMONS.

MONDAY, APRIL 20.

The Clevedon Gas Bill, was read the third time, and passed.

The Burslem and Tunstall Gas, and the Grand Junction Water Bills, as amended, were considered.

TUESDAY, APRIL 21.

The Topsham, Woodbury, and Lympstone Water Bill was read the third time, and passed.

The Cork Gas Bill, as amended, was considered.

The Dundee Gas (No. 2) Bill was read a second time, and committed.

The Metropolis Gas.—A return was presented of copy of correspondence with respect to the supply of gas since Aug. 8, 1867.

WEDNESDAY, APRIL 22.

The Ruthin Water Bill, as amended, was considered.

Metropolis Gas Bill.—Petitions praying to be heard by council against the Bill, from the Imperial Gaslight and Coke Company; Great Central Gas Consumers Company, and others; London Gas Consumers Association, and Mr. Darton and others; Western Gaslight Company; and the Vestry of

St. Marylebone; were referred to the Select Committee on the Metropolis Gas Bills.

Gas (Metropolis) Bill (1860), &c.—On the motion of Mr. Morrison, it was ordered that the reports of the committees on the Gas (Metropolis) Bill in session 1860, the London (City) Corporation Gas Bill in session 1866, and the Metropolis Gas Bill in session 1867, together with the minutes of the evidence taken before the said committees, be referred to the Select Committee on the Metropolis Gas Bills.

Thursday, April 23.

The Brentford Gas; Brompton, Chatham, &c., Water; Dartford Water; and the Slough Water Bills, were reported.

The Burslem and Tunstall Gas, and the Grand Junction Water Bills, were read the third time, and passed.

The Worthing Gas, and the Chichester Gas Bills, were reported.

Friday, April 24.

The Cork Gas Bill was read the third time, a verbal amendment was made, and the Bill passed.

The Loughborough Local Board Bill was read the third time, and passed.

The Ystrad Gas and Water Bill was reported.

HOUSE OF COMMONS.

Thursday, April 23.

(*Before the Right Hon.* Edward Cardwell, *Chairman; Mr.* Greene, *Mr.* John Hardy, *Mr.* Holland, *and Mr.* John Peel.)

METROPOLIS GAS BILL.

GASLIGHT AND COKE COMPANY'S BILL.

IMPERIAL GAS BILL.

LONDON (CORPORATION) GAS BILL.

The committee to whom the above bills are referred sat this afternoon, at three o'clock, for the purpose of taking appearances thereon.

Mr. Hope Scott, Q.C., and Mr. J. O. Phillips were in attendance on behalf of the gas companies; Mr. Webster, Q.C., for the corporation; and Mr. Pope for the promoters of the Metropolis Gas Bill.

Metropolis Gas Bill.—Appearances upon their respective petitions against this bill were taken from the Lord Mayor, Aldermen, and Commons of the City of London; the Gaslight and Coke Company; the Ratcliff Gaslight and Coke Company; the South Metropolitan Gaslight and Coke Company; the Independent Gaslight and Coke Company; the Metropolitan Board of Works; the Imperial Gaslight and Coke Company; the Great Central Gas Company and others; the Western Gaslight Company; the Vestry of St. Marylebone; and the London Gas Consumers Association.

Gaslight and Coke Company's Bill.—Appearances upon their respective petitions against this bill were taken from the Whitechapel Board of Works; the Corporation of the City of London; the Limehouse Board of Works; the Metropolitan Board of Works; the Great Eastern Railway Company; and the Trustees of the River Lea.

Imperial Gas Bill.—Appearances upon their respective petitions against this bill were taken from the Vestry of St. Pancras; the Whitechapel Board of Works; the West Ham Local Board of Health; the Vestry of St. Mary, Islington; the Vestry of St. Marylebone; the Metropolitan Board of Works; the London and North-Western Railway Company; the Great Eastern Railway Company; and the Trustees of the River Lea.

London (Corporation) Gas Bill.—Appearances upon their respective petitions against this bill were taken from the Whitechapel Board of Works; the North London Railway Company; the London and St. Katherine's Docks Company; the Conservators of the River Thames; the Limehouse Board of Works; the Gaslight and Coke Company; the City of London Gaslight and Coke Company; the London and North-Western Railway Company; the Great Eastern Railway Company; the Metropolitan Railway Company; the New River Company; John Peirse Kennard; the East London Water-Works Company; Jean Baptiste Athanase Lorsont; the Independent Gaslight and Coke Company; the Imperial Gaslight and Coke Company; the Great Central Gas Consumers Company; and the Trustees of the River Lea.

The Chairman inquired whether the parties would be ready to go on the next day.

Mr. Webster suggested, as the more convenient course, that the committee should proceed first with the Corporation Gas Bill, inasmuch as the corporation were prepared to submit, with respect to the price at which gas might be manufactured and the illuminating power, a positive case which was not thoroughly gone into last year. He also suggested that probably no decision would be come to on either of the bills before the committee until the case for the Metropolis Gas Bill had been heard; and he applied for an adjournment until Thursday, April 30, in order that witnesses who were in the country might be in attendance.

Mr. Pope, on behalf of the promoters of the Metropolis Gas Bill, stated that he was instructed to assent to whatever course the committee might think most convenient.

Mr. Hope Scott stated that, as far as he was concerned, as representing the opponents to both the Corporation Gas Bill and the Metropolis Gas Bill, he had no objection to the Corporation Gas Bill being taken first.

Mr. Phillips submitted that the Gaslight and Coke Company's bill was first in the list, having been read a second time the first in order, and that the inquiry on that bill was independent of the other two bills, and would probably be finished before Thursday next.

The Chairman stated that the committee were of opinion that they had better take the course suggested by Mr. Webster, and hear the case for the Corporation Bill first, and grant an adjournment until that day week. And with respect to the Gaslight and Coke Company, it would be better not to interpose their case, but to go on with that which was probably the main contest between the parties.

Adjourned to Thursday, April 30, at twelve o'clock.

Legal Intelligence.

ROLLS COURT.—Saturday, April 18.

(*Before* Lord Romilly.)

In re the Slough Gas Company.

In this case a petition for winding up the affairs of the company had been presented. The company was incorporated under an Act of Parliament, 1866, for the purpose of supplying gas for the district within the Slough Local Government Board, and for other purposes. The Slough Gas and Coke Company, Limited, which had been registered under the Companies Act, 1862, was at the same time dissolved, and all its property and liabilities were vested in the new company. The capital of the company was £6000, divided into 600 shares of £10 each, all fully paid up. On the 12th of March last, at the assizes for the county of Bucks, a verdict was given against the company, for £300 damages, in an action brought by Mr. Tilly, of Slough, for a nuisance, which amount it is stated the company are liable to pay, as also the costs, which are comparatively heavy. It is alleged in the petition that, if the company should continue its business, it would be exposed to other actions for nuisance arising out of similar facts to those in respect of which the verdict was obtained, or out of the continuance of the same facts, which it is not possible for the company to obviate. The petitioners state that they owe £800 on a bond of the Slough Gas and Coke Company, which might be called in at any time on six months notice, and £1150 on various debentures; and they are also indebted to their bankers in a sum of £410, of which immediate payment might be demanded; and to other creditors the amount of £900 or thereabouts. The property of the company is not of a total value equal to that of the said debts, together with the amount of the verdict and the costs of the action; and under these circumstances the petitioners submit that it was just and equitable they should be allowed to wind up under the provisions of the Companies Act, 1862, and they pray that all necessary and proper directions may be given by the court for the purpose.

Mr. Jessel, Q.C., said the company found it necessary to petition the court under somewhat extraordinary circumstances. It appeared that they had erected their works near to some houses, and one of the inhabitants, a Mr. Tilly, brought an action against them for a nuisance, and recovered damages to the extent of £300. Ten other actions had also been brought against them, or were threatened, of the same description, and the result would be to ruin the company if they were proceeded with and similar verdicts obtained. The directors had, therefore, found it necessary to wind up their affairs by petitioning the court, in order that by doing so the actions might be stayed. One of the directors had since seen Mr. Tilly, and arrangements, he believed, were likely to be effected with that gentleman, and with most of the others, in fact. It would be undesirable, of course, to deprive the town of gas, and therefore they now proposed to let the petition stand over, in order that they might, if possible, settle matters and stay the actions. The effect of this would be to extend the injunctions. Of course every creditor had a right to appear, and the gentlemen with whom they had not settled might think they were entitled to keep their injunctions against them for another month; but if they took steps to oppose the company, of course they would have to restore their petition in the meantime. He would, therefore, ask that the petition might be restored if any such action was taken.

His Lordship assented to the application, and the petition was ordered to stand over.

Miscellaneous News.

LONDON GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of the Shareholders of this Company was held at the Freemasons Tavern, on Tuesday, April 14—J. R. Hall, Esq., deputy-governor, in the chair.

The Chairman commenced the proceedings by expressing his own regret, and the regret of his colleagues at the board, at the inability of Mr. Sprague, the governor of the company, to take the chair on this occasion. At the time of the last meeting of shareholders Mr. Sprague was not well, and his indisposition had continued, so that it was now quite impracticable for him to attend.

The Secretary (Mr. Hinde) having read the advertisement convening the meeting, the seal of the company was affixed to the register of shareholders, and the minutes of the last meeting were read.

The following report and statements of accounts were presented :—

Your directors submit to you the half-yearly accounts, showing the result of the manufacture and distribution of the company's gas up to the 31st day of December last. A copy of the balance-sheet, and a statement of the profit and loss for the past half year, are annexed to this report. It will be seen that, after appropriating £750 to the redemption-fund, in accordance with the provisions of the London Gaslight Act, 1857, the sum of £30,367 9s. 11d. remains applicable to dividend. Out of that sum, the directors recommend that the dividends upon all classes of preference shares and stocks be paid on or after the 15th inst., and a dividend of £2 10s. per share be paid upon the ordinary shares which were paid up in full on or before the 31st day of December last.

It is very gratifying to your directors to be able to report to the shareholders the continued prosperity of the company. The gas-rental has increased to the extent of £4400 over the corresponding half year, and the improvement in the cost of the manufacture of gas at the company's works has been equally satisfactory.

Many important matters have been carried out since the last report to the shareholders. Among them the enfranchisement of the copyhold ground at Vauxhall, held under the Duchy of Cornwall, has been completed, and the company's works are now entirely on its own freehold. The South-Western Railway has been connected with the company's works at Nine Elms by a siding, affording great facilities for bringing coal into the works when required, as well as sending coke to customers on the line of the railway. The new retort-house is sufficiently forward to be completed this summer, increasing the power of manufacture nearly one-fifth, enabling the company to meet any additional consumption of gas that may be required for a considerable time. The lifts for landing coal, and the staging for conveying it to the retort-houses, have also been completed, and are in action, with much benefit and economy. The gasholder at Nine Elms, injured by the accident in 1866, has been reconstructed, and was in use for some time; some additional repair to the tank has been found necessary, not however of an expensive nature. One of the gasholders at Vauxhall has been substantially repaired by resheeting, and is now again in action. These and other minor improvements add materially to the stability and welfare of the company.

The proceedings in Parliament in reference to the supply of gas in the metropolis have occupied the anxious attention of your directors. It was hoped that a satisfactory measure might have been passed during this session, and, with that object in view, notices were given, and a bill introduced into the House of Commons by the gas companies. Before the second reading, however, it became evident that it was prudent to delay pressing the bill forward at the present juncture. Subsequent to the suspension of this measure, a bill has been introduced by Mr. Morrison, giving certain powers to the Metropolitan Board of Works and the City Commissioners of Sewers, embracing most of the provisions proposed by the committee of the House of Commons last session, as well as others still more objectionable. This bill, affecting very materially the interests of all the metropolitan gas companies, will be closely watched, and the best exertions of your directors used to secure as far as possible the just rights of the shareholders.

The expenses attending these repeated attacks in Parliament on the metropolitan gas companies have become a serious evil; and the consumers of gas, as well as the companies, are sufferers to a great extent.

Two directors—namely, George Hallett, Esq., and William John Lysley, Esq.—retire by rotation, and, being eligible, offer themselves for re-election.

One auditor—namely, George Pearson, Esq.—retires also by rotation, and, being eligible, offers himself for re-election.

Balance-Sheet, December 31, 1867.

Dr.				*Cr.*		
To Shares—				By Plant		£696,696 2 11
7197 ordinary	£359,850 0 0			Meters in use		18,365 3 8
481 blue preference	24,050 0 0			Goods and products in store		18,892 16 0
172 red ditto	8,600 0 0			Amount to receive on shares, viz.:—		
	£392,500 0 0			Ordinary	£2,933 15 3	
5610 first ditto	140,250 0 0			A preference	78,967 10 0	
6922 A ditto	173,050 0 0					81,901 5 3
		£705,800 0 0		Ditto owing for gas	£56,450 18 0	
Debenture stocks		30,114 15 0		Ditto owing for coke, &c.	5,956 8 3	
			£735,914 15 0	Ditto owing for house-rent	1,866 5 5	
Loans			101,555 0 0	Ditto owing for sundries	2,143 19 2	
Trade and other debts			43,859 4 5			66,417 10 10
Unpaid dividends			3,266 14 1			7,937 5 11
Redemption-fund			5,361 16 2	Cash in hand		30,114 15 0
Balance of profit, viz.—				Amount of debenture stocks, as per contra		
From previous half year		£29,673 16 1				
Half year ending Dec. 31, 1867		26,484 12 2				
		£56,158 8 3				
Dividends, Oct. 15, 1867—						
Preference shares	£7,148 1 7					
Debenture stocks	845 6 9					
Ordinary shares	17,797 10 0					
		25,790 18 4				
			30,367 9 11			
			£920,324 19 7			£920,324 19 7

Profit and Loss, Half Year ending December 31, 1867.

Dr.		*Cr.*	
To Coals	£40,862 8 6	By Gas	£83,126 17 10
Wages	12,901 6 10	Coke and other products	22,710 16 11
Tradesmen's accounts	10,282 7 6	Rents	911 14 3
Meters—repairing and fixing	1,795 11 7		
Directory and auditing	800 0 0		
Salaries	2,496 12 0		
Rates and taxes	2,807 16 8		
Rents	1,120 17 2		
Commission	919 14 4		
Stationery	211 0 0		
Incidental expenses	1,203 9 8		
Allowances and bad debts	548 15 7		
Parliamentary expenses	905 0 0		
Balance	29,894 9 2		
	£106,749 9 0		£106,749 9 0
Interest on borrowed money	£2,659 17 0	Balance brought down	£29,894 9 2
Redemption-fund	750 0 0		
Balance	26,484 12 2		
	£29,894 9 2		£29,894 9 2

Dividend-Fund.

Dr			*Cr.*	
To Amount of preference shares dividend, Oct. 15, 1867	£7,148 1 7		By Surplus profits, June 30, 1867	£29,673 16 1
Ditto debenture stocks	845 6 9		Balance as above	26,484 12 2
Ditto ordinary shares	17,797 10 0			
	£25,790 18 4			
Balance	30,367 9 11			
	£56,158 8 3			£56,158 8 3

The CHAIRMAN, in moving the adoption of the report, said there were only two or three points to which he wished to direct the attention of the meeting. He thought the shareholders would agree with the directors in regarding the accounts as most satisfactory. The increase in the rental last half year, as compared with the corresponding half of 1866, was about £4400, which was a very important matter. In the report, the directors gave an account of the various additions and improvements made to the works, not the least of which was the enfranchisement of the copyhold property at Vauxhall, held under the Duchy of Cornwall. It was satisfactory to the board, as it must be to the shareholders generally, to know that this ground was now their own freehold. The communication of the South-Western Railway with the works at Nine Elms was very important, because it gave the company a means of obtaining coal and disposing of coke when, through frost, the river was not navigable. The progress of the new retort-house continued, and in about six weeks it would be completed; also the lifts for landing coal. These, and the other improvements mentioned in the report, tended materially to increase the efficiency of the works and to keep the company's business operations in a properous state. Having mentioned that which was pleasant and agreeable to the directors, he could not quite pass over the next paragraph of the report, which referred to the proceedings in Parliament. The shareholders were no doubt aware of the fact that a bill was now before the House of Commons for regulating the supply of gas. To that bill the most anxious attention of the directors was being given, and they were not without some hope that, in the course of this session, legislation would take place which would be satisfactory, or, at all events, which would stop the agitation that had been going on for some time respecting gas matters. He could not say more concerning the bill than that, in going before the tribunal of a committee of the House of Commons, the directors of this company, in concert with those of other companies, would exert themselves to the utmost to protect the interests confided to their care. With these observations he moved—"That the report of the directors and the accounts now laid before the meeting be received and adopted."

Mr. RHODES seconded the motion, and expressed his gratification that, in the unavoidable absence of Mr. Sprague, the chair was so ably filled by Mr. Hall, who himself, many years ago, discharged the duties of governor of the company. He stated, also, that he had had the pleasure to visit the works that day, and to find them in a state of great efficiency. He concurred in the remarks of the chairman as to the value of the improvements which had recently been effected, and said he believed the works, as a whole, would compare favourably with any others in the metropolis.

The CHAIRMAN, in reply to the last speaker, said it was probable the directors would have to make a call, but he could not state it with certainty.

Mr. SYKES, referring to the bill before Parliament, hoped that the vigilance of the directors would be exercised to protect the interests of the shareholders. One clause in the bill was extremely objectionable. It proposed that the loss sustained by the companies through any accident at their works should fall upon the dividend-fund, and that there should be no power to recoup themselves.

The CHAIRMAN said that clause had been withdrawn.

Mr. SYKES said he was glad to learn the fact. At the same time, he did not regret that the clause was originally inserted, because the more unjust the propositions the more likely were the companies to counteract the sinister designs of the Metropolitan Board.

The motion was put, and carried unanimously.

The CHAIRMAN moved—"That the dividends on all classes of preference shares and stocks be paid on and after the 15th inst.; and that a dividend of £2 10s. for the half year ending the 31st of December last be paid upon the ordinary shares which were paid up in full on or before that date."

Mr. HALLETT seconded the motion, which was put and carried.

The retiring directors and auditor were re-elected, and severally acknowledged their obligations to the proprietors.

A vote of thanks was given to the directors for their services, which was responded to by the CHAIRMAN.

A vote of thanks was also given to the secretary, engineer, and other officers of the company.

Mr. HINDE, as the senior officer, acknowledged the vote, and said it was a great pleasure to him to be able to state that there was the most perfect unanimity and good feeling amongst them. He believed, that the interests of the proprietors were, as far as the duties of the officers were concerned, properly attended to.

A vote of thanks was given to the auditors, and the proceedings terminated.

UXBRIDGE GAS.—For some time past the inhabitants of Uxbridge have been endeavouring, but until recently without success, to discover the cause of certain noxious smells that have been prevalent in the streets, in our shops, and private houses. Now, however, there is no doubt that the various surmises indulged in were incorrect, and that to the impurity of the gas supplied by the Uxbridge and Hillingdon Gas Company may be traced the sole cause of the abominable stenches which have met us at every turn. To be satisfied upon the point, we have applied the simple sugar-of-lead test, and have found sulphuretted hydrogen present in the gas in large quantities. This is a state of things that should not, and must not, exist; for surely if our tradesmen are content to pay a long price for the use of the article, they have a right, at least, to expect that they shall not be inconvenienced by being compelled to put out their lights, as we understand has been the case, at the time they most need them. The remedy is very simple. In proof of this latter statement we extract a few observations from an authority on the subject:—"The gas and its accompanying vapours are next made to traverse a refrigerator, usually a series of iron pipes, cooled on the outside by a stream of water; there the condensation of the tar and ammoniacal liquid becomes complete, and the gas proceeds onwards to another part of the apparatus, in which it is to be deprived of the *sulphuretted hydrogen* and carbonic acid gases always present in the crude product." The neglect of the latter portion of the process would appear, therefore, to be the cause of complaint the public can raise against the gas authorities, whose duty it imperatively is to at once adopt proper remedies, or, in other words, to give us pure gas with as little delay as possible.—*Buckinghamshire Advertiser.*

TUNBRIDGE WELLS.—A special meeting of the Improvement Commissioners was held on Monday week at the town-hall, to receive a report from the Town Sewage Outfalls Committee, and, if the report be adopted, to pass such resolutions thereon as may be expedient with respect to the disposal of the northern outfall sewage; to approve certain provisional agreements with Mr. W. A. Smith and Mr. Julian Goldsmid, respectively; and to authorize the chairman of the board to seal, and the committee to carry out, such agreements. The Hon. F. G. Molyneux presided. The report, after a long discussion, was agreed to.

RIO DE JANEIRO GAS COMPANY, LIMITED.

The Third Annual General Meeting of the Shareholders of this Company was held at the London Tavern, on Thursday, April 16—JAMES ATHERTON, Esq., in the chair.

Mr. DECASTRO (the secretary) having read the notice convening the meeting, the minutes of the last meeting were read and confirmed.

The following report and statement of accounts were then presented:—

The directors, in accordance with the Articles of Association, paid, on the 14th of October last, an *ad interim* dividend of £30,000, being at the rate of 10 per cent. per annum, and have now much pleasure in submitting to the shareholders the annexed statement of accounts for the twelve months ending the 31st of December last, duly audited, and showing a balance at the credit of profit and loss account of £70,254 19s. 3d., reduced, by the above *ad interim* dividend, to £40,254 19s. 3d.

The directors cannot doubt that this result will be deemed highly satisfactory under existing circumstances in Brazil.

Out of the above-mentioned sum of £40,254 19s. 3d., the directors recommend that a dividend at the rate of 10 per cent. per annum, also free of income-tax, be paid for the half year ending the 31st of December last, and which will absorb £30,000, leaving £10,254 19s. 3d., which the directors have disposed of as follows, viz.:—They have placed £7000 to the insurance and contingency fund, and carried forward to next account £3254 19s. 3d., out of which income-tax for the past year has to be paid.

The reserve-fund now stands at £4000, and the insurance and contingency fund at £11,000.

Mr. Richard Carruthers is the retiring director, in accordance with the Articles of Association, and, being eligible, offers himself for re-election.

The auditor, Mr. Harding (of the firm of Harding, Whinney, Gibbons, and Co.), also retires, and offers himself for re-election.

Dr. *Balance-Sheet, for the Year ending December 31, 1867.* *Cr.*

To Capital, in 30,000 paid-up shares of £20 each			£600,000	0	0	
Bills payable			12,838	4	4	
Sundry creditors at Rio and London			6,281	2	9	
Dividend warrants still unclaimed			266	0	0	
Reserve-fund			4,000	0	0	
Insurance and contingency fund			11,000	0	0	
Profit and loss—						
Balance of profit brought forward, Dec. 31, 1866	£3,323 8 5					
Income-tax for half year, 1865	£623 5 11					
Ditto for the year, 1866	998 15 3					
	1,622 1 2					
		£1,701 7 3				
Net profits for the present year		61,553 12 0				
			63,254 19 3			
			£697,640	6	4	

By Sundry assets, viz.:—					
Gas-works, houses, land, 128 miles of mains, asphalt-works, mules and carts, lighters, &c.	£382,705	14	8		
Coals and gas-fittings	21,327	9	8		
Sundry debtors, being gas consumers at Rio	25,618	5	6		
Cash at Rio	459	1	3		
Ditto in London	1,342	14	0		
Bills receivable	22,000	0	0		
Bills of exchange in transit	8,291	19	11		
Shipments afloat	5,895	1	4		
Interim dividend of the 4th of October, paid to shareholders, at the rate of 10 per cent. per annum on £600,000	30,000	0	0		
	£697,640	6	4		

The CHAIRMAN moved the adoption of the report, and, in doing so, said: Gentlemen, as you have been in possession of the report of the directors and the balance-sheet, showing the business of the company for the year 1867, there is little left for me to say to you upon this occasion. I may remark, what is indeed well known to you all, that the war between Brazil and her allies with the Dictator of Paraguay has been going on now for three years. I can well understand when that war was commenced that the conviction on the part of Brazil and her allies was that it would be very soon brought to a satisfactory conclusion. It has, however, been proved that the nut has been too hard to crack. The war continues, and has been a most serious drain upon the resources of Brazil. The slow progress made in its prosecution created very considerable discontent in the country during the past year, and much dissatisfaction was expressed at the want of energy exhibited. At that critical moment a further demand for a large increase of men, money, and munitions of war was made by Caxias, the general-in-chief of the allied forces. You may conceive the disappointment felt throughout Brazil upon such an occasion, but with a heroism which is deserving of the highest possible praise, the Government and people of Brazil determined that, at whatever cost, the demand should be complied with, and that the war should be prosecuted with greater vigour, in order that it might, if possible, be brought to an early and glorious termination. But, gentlemen, what has been the result? The trade and industry of the country is paralyzed by it. Every interest is, I may say, blighted. The currency of the country, which at par stands at 27, fell as low as 13¾, with every prospect of its going down to 10. A personal friend of my own, a merchant in Brazil, told me the other day that he was determined not to sell a single article of merchandize except at a price which covered all costs and charges at the exchange of eightpence. I mention this to show the low state to which the public mind had fallen in Brazil by reason of this war. It was under the circumstances I have thus briefly indicated to you that the business of this company had to be carried on, and I do think I shall not be thought too presumptuous in saying that the statement we have laid before you to-day for your approval, showing, as it does, a profit out of which we are enabled to pay you a dividend of 10 per cent., free of income-tax, to add £7000 to the insurance and contingency fund, and to carry forward £3254 19s. 3d. to the next account, is extremely satisfactory, and shows a state of things upon which I think I may safely and confidently offer to you my sincere and hearty congratulations. Under these circumstances I think you will agree with me in considering the result as most excellent. I feel sure that those who are in any degree acquainted with the state of Brazil will come to the same conclusion. I may here mention that when the prospectus of this company was issued to the public there was a declaration in it to the effect that there was offered to the public a property that would at once yield a dividend of not less than 10 per cent. I think it well to call your attention to that fact, inasmuch as the result of the company's operations during the time that it has been in existence, now bordering on three years, shows that the statement made in the prospectus has been fulfilled to the letter. At no period since the opening of the works have the receipts been less than 10 per cent., and, as you will observe, they are now more. There is another point to which I think it right to call your attention, and that is that our financial position, which is a very important matter in connexion with the company, is of a highly satisfactory character. It has ever been the anxious desire of the board that this company should be as early as possible independent of banks, money-lenders, and everybody else. I am happy to say we are now in that position. We can lay our heads upon our pillows every night without feeling any anxiety with regard to the morrow. More than that, we can go into the market and purchase our cannel and our coals, and every thing else we want, and we can pay for them on delivery. I need hardly point out to you the great advantages accruing from such a position; and, looking at the events which have taken place in this country during the last few years, and which are well known to you all, it is a position upon which we may with great propriety congratulate ourselves. There is one other point that I shall just touch upon, though it scarcely affects our interests, except in an indirect manner. Often, in conversation upon the prospects of the different states af South America, I have found people speak of them as "those ever restless South American republics." Very few make the distinction that Brazil is not a republic, but an hereditary monarchy. All her institutions are constitutional and representative, totally different from those of the surrounding republics. Her press is free; and though she has a State religion, which is Roman Catholic, there is full liberty of conscience and action for all other denominations. Indeed, their monarchy and institutions are almost an exact reflex of our own. The humblest man in Brazil can, if he only possess the ability, attain to the highest position in the Government of the country. I mention these matters to you, although they have no direct connexion with the business, because they go to prove the fact that our undertaking possesses a solidity which would not exist if our property were placed in any of the republican states. I do not know that I have anything more to say to you upon this occasion; in fact, I have to apologize to you for occupying your attention so long, and to thank you for the courteous way in which you have heard my remarks. I will now conclude by moving—"That the report of the directors and the statement of accounts for the year ending Dec. 31, 1867, now read, be received and adopted."

Mr. LEWIS HOWARD (a director) seconded the motion, which was unanimously adopted.

The CHAIRMAN moved—"That a dividend at the rate of 10 per cent. per annum, free of income-tax, be and is hereby declared for the year ending Dec. 31, 1867."

Mr. HOWARD seconded the resolution.

Mr. SMITH said he observed, by the balance-sheet, that the directors had, in addition to placing £4000 to the reserve-fund, carried £7000 to the depreciation account.

Mr. HOWARD replied that it was not so; the £7000 was carried to the credit of the insurance and contingency fund. At the last meeting Mr. Smith and some other shareholders objected to any money being set aside at all, and the directors then entered fully into the reasons for what they had done. He (Mr. Howard) mentioned at the time that one reason was that the works of the company were not insured, and therefore they ran a great risk, and to the minds of the directors it appeared absolutely necessary that a sum of money should year by year be set apart from the profits of the undertaking to meet any contingency which might arise.

Mr. SMITH said he quite concurred with the directors that it was necessary to set something aside for the purpose, but he wanted to see it done upon some principle, and not in the arbitrary manner which the directors had adopted. Looking at the accounts, he saw that they had written off £1000 from the plant, so that they were burning the candle at both ends.

Mr. HOWARD said the reserve-fund was, by the Articles of Association, devoted to one specific purpose, the equalization of dividends.

Mr. SMITH asked why £1000 had been written off the plant. The works ought not to be allowed to deteriorate, as there was a fund for the purpose of reinstating them, and he should rather have expected to find them increase in value. He was perfectly satisfied with the way in which the works were conducted, but he objected to the mode in which the accounts were stated.

The CHAIRMAN said, with regard to the sum of £900 or £1000 written off the plant, it was mentioned on a former occasion that it was for retorts and such things, which were continually depreciating in value. As to the other and more important question, he must say that he differed entirely from the honourable proprietor; and, looking at the proud position which the company had attained during the two or three years of its existence, he thought he might do so with reason. At the present moment they were entirely independent, but it was most important that they should be in possession of a fund to meet any contingencies that might arise. As soon as the war ended—which he had no doubt would be before long—trade would revive, the resources of Brazil would be developed, and those institutions which were now paralyzed would once more be in vigorous activity. With the revival of trade would come an increased demand for gas; and he thought the directors would be guilty of a dereliction of duty if they did not make provision for new lines of mains, and other things that would be required for the development of their property. The reserve-fund was by deed devoted to a special object—the equalization of dividends—and therefore they must look to the contingent-fund for requisite capital, which was far better than having to borrow money from the bankers, or issue debentures, or take any step of that kind.

Mr. PELLY said, if he were to find fault with the contingent-fund, it would be that it was too small, not that it was too large. It was evidently an insurance-fund, and the directors were adopting the policy of the large steam-packet companies, who did not insure their property, but laid aside a sum of money annually to provide for any casualties that might arise. If a fire happened, and destroyed the buildings of this company, what position would they be in without some means of restoring them; but, by setting aside £7000 annually they would ultimately have such a fund that they would be no losers by such a calamity. He hoped that by the revival of commercial affairs in Brazil, which he thought must take place very soon, the use of gas would be extended, so that before next year this sum would be much increased.

The CHAIRMAN said he was happy to tell the meeting that the managing director (Mr. James), who had had charge of the works in Rio since they were commenced, was present, and would be glad to answer any questions that the shareholders might ask him.

Mr. SMITH said he should like to receive some information as to the

prospect of finding coals near Rio. He had heard that there was coal within twenty miles of the city.

Mr. JAMES said the honourable proprietor was mistaken. There was no coal nearer to Rio than the province of St. Catherine, which was 400 miles off. There was also coal at Rio Grande, which was 800 miles distant, but he had more hope of the St. Catherine coal being available at a future day. The coal at Rio Grande was in a very remote and inaccessible locality, and the freight from there to Rio Janeiro would be double that of the freight from Liverpool.

The motion was put, and carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. M'GREGOR, the retiring director, Mr. Carruthers, was re-elected.

Mr. Harding, the retiring director, was also re-elected, on the motion of the CHAIRMAN, seconded by Mr. HOWARD.

Mr. PELLY moved a vote of thanks to the chairman and the board of directors, for their able management of the company during the past year.

Mr. R. WILSON seconded the motion, which was carried unanimously.

The CHAIRMAN acknowledged the vote, and said it was very gratifying to the board to receive such expressions of satisfaction and approval from the shareholders. He was glad to be able to state that arrangements were being made with respect to the management of the company at Rio, which the directors hoped would result in a saving to the company of £2500 or £3000.

GREAT CENTRAL GAS CONSUMERS COMPANY.

The Thirty-fourth Half-Yearly Ordinary Meeting of the Shareholders of this Company, was held at the London Tavern, on Friday evening, April 24—Alderman DAKIN in the chair.

The SECRETARY (Mr. R. M. Massey) having read the notice convening the meeting, the seal of the company was affixed to the register of proprietors.

The following report and statement of accounts was then presented.

The directors herewith submit the usual statements of account, by which it will be seen that there is an available balance of £11,103 19s. 2d. after the payment of all working expenses, interest on debentures, &c., and the directors recommend that a dividend be declared at the rate of 10 per cent. per annum, payable on the 25th of May next. After the payment of this dividend a surplus of £1103 19s. 2d. will remain to the credit of the company, to be carried to the next half year's revenue account.

The shareholders are already aware that the gas supply of the metropolis is again to be brought under consideration of Parliament during the present session. A bill for this purpose has been introduced by Mr. Morrison. There are several most objectionable clauses and provisions in the bill, prejudicially affecting the interests of the proprietors; these the directors have, in conjunction with other metropolitan gas companies, determined to oppose in committee, with a view to their being amended so as to be in accordance with provisions of previous Acts of Parliament, by which the fair rights of the proprietors were recognized, and the interests of the consumers protected.

The directors will give their anxious attention and consideration to the measure whilst in committee, with a view to the final and satisfactory settlement of a question, the repeated agitation of which has so long and injuriously affected the property of the shareholders.

Two of your directors, Mr. G. H. Bovill and Mr. Virtue, retire, and offer themselves for re-election.

ANNUAL STATEMENT OF ACCOUNTS,

Showing the Actual State and Condition of the Concerns of the Great Central Gas Consumers Company, for the Twelve Months ended the 31st Day of December, 1867.

I. CAPITAL.—*State of the Account at the End of the above Twelve Months.*

Statute or Authority under which raised.	Number of Shares.	Amount per Share.	Paid up per Share.	Total paid up.	Total Capital.
Shares. (14th & 15th Vict., cap. 69, 185.)	20,000	£10	All.	£200,000	£200,000 0 0
			Rate per Cent.	Amount.	
Borrowed moneys			5	£66,000	66,000 0 0
Profits capitalized					None.
			Total capital		£266,000 0 0

II. REVENUE.—*Account during the above Twelve Months.*

INCOME.				EXPENDITURE.			
Balances brought forward—				Management—			
Revenue account	£898 8 7			Directors allowances	£1,500 0 0		
Dividend ditto	10,000 0 0			Salary of secretary and clerks	1,282 0 0		
		£10,898 8 7		Collectors commission and pay	976 5 4		
Sale of gas—				Rent, rates, and taxes of offices	486 7 2		
Common gas, at 4s. per 1000 feet.	£74,433 16 6			General charges, including stationery and printing	1,970 10 7		
Public lighting and under contracts.	8,963 15 3			Payment to auditors	90 16 6		
		83,317 11 9				£6,305 19 7	
Ditto of residual products—				Manufacture of gas—			
Coke and breeze	£18,615 3 3			Coals, including carriage, dues, &c.	£41,635 15 9		
Tar and ammoniacal liquid	4,802 15 6			Purifying materials	437 11 8		
		23,417 18 9		Supervision and labour	12,553 7 4		
Miscellaneous receipts		21 15 6		Stores, tools, implements, ordinary repair and maintenance of premises and plant	7,898 2 9		
				Rents, rates, and taxes of manufactory	1,326 7 4		
						63,950 4 10	
				Distribution, including service-mains, pipes, and ordinary repair and maintenance	£9,774 16 1		
				Meters—			
				Restoring and replacing	1,848 12 10		
						11,623 8 11	
				Law and parliamentary charges	£1,452 2 1		
				Interest paid from profits, on £66,000 borrowed capital, at 5 per cent.	3,300 0 0		
						4,752 2 1	
				Balance for shareholders profit.		30,000 0 0	
Total income		£117,735 14 7		Total expenditure		£116,631 15 5	
Ditto expenditure		116,631 15 5					
Balance to revenue next year		£1,103 19 2					

III. DIVIDENDS.—*Account of all Dividends actually Paid in the above Twelve Months.*

Balance for shareholders profit, as above	£30,000 0 0	Dividends declared April and October	£20,000 0 0
		Balance to next year's account	10,000 0 0
	£30,000 0 0		£30,000 0 0

The CHAIRMAN: Gentlemen, it is now my duty to move—"That the report and accounts, as circulated among the proprietors, be received and adopted, and that a dividend be now declared at the rate of 10 per cent. per annum for the half year ending the 31st of December last, payable on and after the 25th of May next." I do not know that I shall have a long speech to make to you, for I think the first paragraph of the report sufficiently explains the position of the company. The report indeed consists mainly of two paragraphs, the first relating to the results of the working of the last half year, and the other to that matter which we all look to with some interest—viz., the condition of the gas question before the Legislature. With regard to the working of the half year, I think you will agree with me that the fact of our being able to pay you 10 per cent. and carry over a surplus of £1103, after incurring the necessary expenditure on plant, which I shall presently explain to you, is of itself extremely satisfactory. The figures of the account run very much upon the old basis. The most important matter, and that which we most anxiously look to, is the condition of the revenue. On the present occasion I think you will see that there is cause of congratulation in this respect. You will find that the revenue for the year, arising from the sale of gas alone, was £83,397 11s. 9d. For the year ending Christmas, 1866, the amount was £78,024 19s. 11d., so that there has been an increase of £5373, which is a very substantial increase in the rental of the company in one year. Because, as you know, we are not like some other companies. We are said, indeed, to have the advantage of being in a condensed area, but then we have the disadvantage of not being able to extend ourselves or to stretch out our arms, and so increase our rental. However, within the bounds we are circumscribed to, we do our very best to increase the rental; and, as we stated to you on a former occasion, we take every advantage of the erection of new buildings, and the introduction of railways into the City, to extend the business of the company. I am glad to say that in this direction, especially in obtaining the lighting of the railways, we are very fortunate in getting new customers for a large supply of gas. The account for residual products is not so favourable. The total receipts under that head are, indeed, larger, being £23,417 18s. 9d. for the year 1867, as against £22,623 12s. 10d. for the year 1866; but that is not an adequate increase as compared with the increase of the gas-rental, for this reason, that the price of residual products has very sensibly diminished. The price of coke especially, which is the most important element in the sale of residual products, has been greatly reduced. Indeed, I may say that the ruling price of coke has been from 30 to 40 per cent. lower than it was. We hope a favourable change may take place in this respect. The diminished value of products applies likewise to tar and ammoniacal liquor. Under the circumstances, all we can do is to endeavour, by economical working, to make up for the deficiency in this item. The items on the other side of the working account run very much as before. Under the head of "Manufacture of gas," the "cost of coals, including carriage, dues, &c.," has been £41,635 15s. 9d. during the last year, as against £39,802 11s. 11d. in the previous year; but of course that increase is caused by the greater quantity of gas manufactured. There is an increased cost of £1800, but then there is an increased gas-rental on the other side of £5000,

which very satisfactorily accounts for it. I am glad to be able to inform you that we have just concluded a contract for coals for the ensuing year with the parties who have for some time supplied us, at a considerable reduction of cost—something like 9d. per ton—which is a subject for congratulation, as this will go in aid of the deficiency in the value of residual products, should that continue. There is a very large increase, you will find, by a comparison of this account with that for the previous year, in the amount expended under the head of "Stores, tools, implements, ordinary repair and maintenance of premises and plant." We have always told you that we felt it to be an important principle to maintain the plant of the company in a perfect and efficient state, and not to increase our profits by allowing the plant to fall into disrepair or become of less value than it was originally. You are aware that one of our most anxious duties has been to pay attention to the diminution of the impurities of the gas, especially with reference to the presence of sulphur. Of late years the attention of chemists has been much directed to the question of reducing the amount of sulphur in coal gas, and we have been subject to most stringent regulations in this respect. The parliamentary standard is that the gas supplied by us shall not contain more than 20 grains of sulphur in every 100 cubic feet, and we have striven very hard and anxiously to keep within that limit. We had great difficulty in doing so until, bringing to our aid all the resources of scientific investigation, we have seen it right to put up a new set of purifiers, at a very large expense. We have spent nearly £4000 during the last year in this matter, and we have now, by the use of dry lime and oxide of iron, brought our purifying system to a high state of perfection. All this cost has been taken out of revenue, and we have done so upon the principle that, as the old purifying-house is now thrown out of use by the progress of modern discovery and improvement, it is quite right that it should be replaced, not out of the capital, but out of the earnings of the company. Indeed, we are in that condition which of late has been considered extremely desirable. We have a closed capital account, and we have no funds from that source to go to even if we were inclined. All improvements of this kind must, therefore, necessarily come out of revenue. But it is not only a necessity of our position, your directors feel that the propriety of the case demands that, if any part of the machinery becomes worn out or is displaced by modern improvements, its place should be supplied out of our revenue. This will explain the large increase of expenditure under this head. The same observation applies also to the item of "Distribution." During the past year the expenditure under this head was £9774 16s. 1d., as against £8068 8s. 5d. in the year 1866. We have been relaying systematically all the services of the company. As you know, this is our 34th half-yearly meeting; the company has, therefore, been in existence for 17 years. We have been at work during the past year inspecting all the services throughout our district, for we know that the important matter of leakage depends more upon the condition of the service-pipes than of the mains. They are made of wrought iron, are more readily oxidized, and therefore more liable to damage. In relaying them we have adopted a new and very expensive mode of proceeding, that of relaying them in wooden trenches and asphalting them over; but we expect they will be more permanent in the future, and that our leakage from this source will be considerably diminished, thereby preventing any complaints of nuisance or the possibility of those escapes which give rise to accidents such as those from which we have suffered so much. The same remark, I may say, applies also to meters. During the past year we expended under this head £1848 12s. 10d., as against £1286 19s. 3d. in 1866. We have systematically been taking down all our meters and having them retested and repaired, so as to be in every respect accurate instruments for measurement as between buyer and seller. That has taken a large amount from our revenue during the year; but it is so far satisfactory that, notwithstanding all these necessary outgoings, we have been enabled, by the increased rental from the supply of gas and the economy of working, to meet these expenses without trenching upon that which we think you ought to have according to our constitution—a dividend of 10 per cent. I do not know that I need say anything more about the figures of the accounts. Then, gentlemen, with regard to the second paragraph of the report, which relates to the condition of the gas supply of the metropolis generally. You are aware we have been very much—I was going to say harassed of late by attacks on all sides. The question is now again before Parliament, and a committee has been appointed, of which Mr. Cardwell is the chairman, to consider the subject. That committee met for the first time yesterday, at three o'clock, and we attended the meeting. The metropolis gas bills before that committee are, first of all, a bill the promotion of which is not very clear, but it is a bill introduced by parties who are understood in some way to be connected with the vestries. The vestries, however, I believe decline to meet the expenses of that bill, and it is supposed the Metropolitan Board of Works will take it up. At present they shrink from the duty, and we do not quite know who are the actual promoters of the bill, which has been introduced by Mr. Morrison. Now, that bill is in some particulars a bill that possibly might be moulded into a proper shape to become an Act of Parliament, and we feel very desirous, if it is practicable, to put an end to the harassing litigation which has so long distracted the attention of our officers from their duties, and been a source of heavy expense, and to bring an unprofitable warfare to a close. The bill proposes that the present prices of gas shall continue until the 1st of January, 1870, and that then the price shall be 3s. 9d. per 1000 cubic feet, and the standard of illuminating power 16 sperm candles. According to our experience, we believe that that is a price which could not be remunerative. The satisfactory part of the bill is that it recognizes the right of the shareholders to receive a 10 per cent. dividend, and while prescribing the price of gas and the illuminating power I have mentioned, it provides that if, in supplying gas on those terms, the companies cannot realize 10 per cent., the Board of Trade may appoint arbitrators, who shall inquire into any circumstance affecting the cost of materials, or any other matters, and readjust the conditions, so that, with a proper attention to manufacture and economy of administration, that rate of dividend may be secured. That is a fair principle so far as it goes, and we should be content with it, only we think that the price of 3s. 9d. for 16-candle gas is scarcely sufficient for our purpose, and upon this point we shall have to make our case clear to the committee. There are no purchasing powers now in the bill, but there is a most objectionable provision for compelling the companies to amalgamate. Now, we very much desire to carry on our works, and remain, as we have done for many years, manufacturing gas for ourselves, managing our own affairs, and not be compelled against our will to amalgamate with other companies. Mr. Cardwell, however, has got it clearly into his judgment that it would be a matter of great economy if the whole of the metropolis were supplied with gas by one company, as his remarks last year prove—and, indeed, the whole report of the select committee of last session tended in that direction. We do not think that is a true position, and I will tell you why. There is one company which manufactures nearly one-third of all the gas supplied in London, but that company does not manufacture more advantageously or more cheaply than some of the smallest companies in the metropolis. We think that is a fact which shows—and we shall be prepared to sustain our view before the committee—that to throw the whole gas manufacture of the metropolis into the hands of one large company would not really be productive of any or, at all events, of much economy to the consumers or to the proprietors of gas shares; whereas it would take away from localities those who have been accustomed to supply them, who are acquainted with the peculiar wants of each, and able to adapt themselves to what is required by them. The proposition, therefore, in this bill, for compulsory amalgamation, we shall most strenuously resist; and if it can be got over, possibly something may be made out of the bill which may be satisfactory to those who are promoting it, and which may fairly be considerate of our interests. If it be so, it will be our earnest desire to promote legislation, and thus put an end to an agitation which distracts our attention from our legitimate business. Then there is another bill before Parliament, promoted by the corporation of the City of London. They propose to manufacture 18-candle gas, and sell it for 3s. 6d. per 1000 cubic feet. Now, we believe that is a matter of impossibility; but the corporation will be heard upon it before the committee, and it will be the duty of the companies to show, from their knowledge and experience, that the thing cannot be done. The scheme of the Corporation Bill is that they are to raise capital on the security of their gas-rates. Now, if I know anything of the money market, and the conditions of raising money just now, I can only say that if that is the security they have to offer—viz., their gas-rates produced by supplying 18-candle gas at 3s. 6d., I am afraid those who lend their money will run a very great chance of not getting their interest. We expected yesterday that the committee would have decided upon taking the general bill first, because that deals with the question of the whole metropolis; but it appears that the corporation, through their counsel applied to have their bill heard first, and, as no great objection was made to that course by any party, it was settled that on Thursday next the City Bill should be introduced before the committee: and this, gentlemen, is the position in which the metropolis gas bills at present stand. All I can say is, that the directors of the several companies will feel it their duty to exert themselves to the utmost in the defence of the rights and interests of their constituents. We consider that your money was advanced on the faith that Parliament, so long as we comply with the obligations imposed upon us, would respect the conditions annexed to them. That is the great principle we shall appeal to; and, as I believe we cannot be impeached in any way, either as regards the quality, abundance, or regularity of the supply of gas, I think we shall not appeal to that principle in vain. We have no complaints in our district; I believe every one is perfectly satisfied. Instead of giving an illuminating power of 12 candles, which is the parliamentary standard, we have on the average given very nearly 14 candles; and, owing to the improved mode of purifying our gas, the quantity of sulphur in our gas has not exceeded 14 grains per 100 feet. I believe, therefore, that our mode of conducting business will be unimpeached; and I trust to the justice and fairness of Parliament that we shall not suffer any wrong from the approaching inquiry. With these remarks, gentlemen, I beg to move the adoption of the report, and the payment of the dividend recommended by the board.

Alderman Sir THOMAS GABRIEL seconded the motion, which, after some remarks from Mr. WATSON on various items in the accounts, was put, and carried unanimously.

The retiring directors were then re-elected.

Some conversation ensued as to increasing the remuneration of the secretary, in the course of which the highest testimony was borne by the shareholders and directors to the ability, zeal, and urbanity uniformly displayed by Mr. Massey in the fulfilment of the duties of his office. The further consideration of the subject was postponed till the next meeting.

A vote of thanks was given to the directors for their continued attention to the affairs of the company; and, the CHAIRMAN having responded, the proceedings closed.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS—FRIDAY, APRIL 17.

At the Weekly Meeting of the Board, held at the Offices, Spring Gardens—Sir JOHN THWAITES in the chair,

A communication was received from the solicitor to the board as to the bill for amending the Metropolis Gas Act of 1860, and to make further provision for regulating the supply of gas to the metropolis.

Mr. SHAW said there were several grave considerations in the bill which were certainly adverse to the interests of gas consumers. He did not suppose that the board would for a moment entertain the idea of becoming the proprietors of the gas-works, but the position of the City in this respect might be somewhat different, and in the event of the corporation of the City determining to buy up the City Gas-Works, by the bill the whole cost and expense of the transfer would fall on the metropolis. Then, again, by the 71st section, whatever arrangement might now be entered into with regard to the price and illuminating power of the gas, the whole might be changed in the three years and set aside by the Board of Trade; and, if two members of a commission to be appointed by the Board of Trade should think fit, they might fix the price and illuminating power of the gas, as prescribed by the Act of 1860. Here obviously, then, the consumer would be in a far worse position than at present. Therefore, if gas was then 4s. per 1000 cubic feet, with an illuminating power of 14 candles, but by the Act of 1860 the maximum price of gas was fixed at 6s. per 1000 cubic feet, with an illuminating power of 12 candles, he contended that the bill was not in the interest of the consumers, but it would be a protection of the worst abuses of the gas companies; and, to crown all, the consumers were called on to pay not only all costs, charges, and expenses preliminary and incidental to preparing, applying for, and obtaining this Act, but by the last section of the bill to pay all similar costs and expenses incurred by the Board of Trade in relation to the Metropolis Gas Act introduced in the first session of Parliament in 1867. Under those circumstances it would be better far for the interest of the metropolis gas consumers to oppose the whole bill than to accept a bill containing so many objectionable clauses, a portion of which only he had alluded to.

It was agreed that a petition be sealed and presented against the bill.

SPECIAL MEETING—SATURDAY, APRIL 25.

The Committee of the whole Board on the Metropolis Gas Question sat this morning at eleven o'clock, after which a special meeting of the board was held to receive a report from the committee—Sir JOHN THWAITES in the chair.

The CLERK read the following report:—

Metropolitan Board of Works, Spring Gardens, April 25, 1868.

Report of the Special Committee of the whole Board on the Supply of Gas to the Metropolis.

Your committee have to report that, in pursuance of the resolution of the board of the 3rd inst., they have considered further the bill now before Parliament to amend the Metropolis Gas Act, 1860, and to make further provision for regulating the supply of gas to the metropolis.

The bill, as regards many of its provisions, appears to your committee to be of an impracticable character, and by no means calculated to effect the object which the board, as the representatives of the ratepayers, have in view—viz,, to secure a better

and cheaper supply of gas to the metropolis. The effect of the bill, if passed in its present shape, would, amongst other things, be—

1. To throw the cost of the last and the coming investigation upon the board.
2. To place considerable patronage in the hands of the Board of Trade.
3. To secure to the shareholders of the gas companies a maximum dividend to an extent not approved of by the select committee of the House of Commons of last session.
4. To perpetuate the nuisances and annoyance arising from the present occupation of the City and other populous districts by gas-works, &c.
5. To leave the price of gas dependent on the decision of the commissioners proposed to be appointed by the Board of Trade, whose first duty it will be to secure to the companies a maximum dividend, and thus deprive the consumers of any future benefits which might result from the discoveries of science with regard to the manufacture of gas.
6. To prevent all future competition, and, by means of amalgamation, to establish a permanent monopoly.

In the event of the board deciding on the alternative of purchasing the properties of the gas companies, with a view to undertaking themselves, on behalf of the ratepayers, the manufacture of the gas required for the metropolis, the machinery proposed by the bill would, in the opinion of your committee, be very inadequate for the purpose, and special provisions would have to be introduced to secure the necessary powers for carrying out so large an object.

Your committee have carefully considered the course which they would recommend the board to adopt with regard to the bill, and it appeared to them that the best course would be for the board to propose in committee of the House of Commons such amendments in the bill before them as, in their judgment, were best calculated to protect and promote the interests of the consumers of gas and the ratepayers generally. They accordingly instructed the solicitor to obtain the assistance of counsel, and prepare clauses that would best provide for these objects. These clauses your committee have had before them this day, and they now beg to submit the same for the approval of the board, and to recommend—

That the solicitor and parliamentary agent be instructed to submit them to the select committee of the House of Commons, and endeavour to procure their insertion in the bill now before them.

(Signed) JOHN THWAITES.
WM. NEWTON.
J. O. HALL.

The SOLICITOR then read the heads of the proposed clauses.

Mr. NEWTON, in moving the adoption of the report, said he need not remind the board that they had always refused to promote any bill having relation to the purchase of the gas-works of London, or to promote any bill having reference to the control of the gas companies. They had, however, this session, as in previous sessions, determined, in the interests of the ratepayers and consumers, to keep a watchful eye on any legislation that might be initiated. They were now in the position of having a bill before a committee of the House of Commons, brought in by Mr. Morrison, which, in the judgment of the committee of this board, contained some very objectionable clauses; and he thought he might say that, in the judgment of the committee, unsettled very much that which was good in the Act of 1860, without settling anything for itself. It certainly proposed a reduction in the price of gas and an increase in the illuminating power, to take place at once, or very soon after the passing of the bill. But this was only such a price and such an illuminating power as twelve months ago the gas companies expressed their willingness to adopt. By the bill it was proposed that at the beginning of 1870 the price of gas should be reduced absolutely to 3s. 9d. as a maximum, with an illuminating power of 16 candles as a minimum. But, at the beginning of the year following, it would be competent for the companies, if they disagreed to these terms, to call into requisition a board of commissioners, to be appointed by the Board of Trade, who would have power to reconsider the whole question, and from year to year they would be able to do the same thing; so that there could be no doubt the agitation, both in reference to price and illuminating power, would be of annual occurrence, and there would be a complete unsettlement of all matters between the companies and the consumers. The Act of 1860 said in effect that there should be a maximum price of 4s. 6d. and a minimum illuminating power of 12 candles; but that price had since been reduced and that illuminating power increased by the voluntary act of the gas companies—*i. e.*, by improvements in the methods of manufacture, they had been enabled to pay their shareholders 10 per cent. dividends, which was the utmost allowed them by law, and still to reduce the price generally to 4s., with the exception of two companies, who charged even lower than that, while the illuminating power of the gas was said to be equal to 14 candles. But there had been an agitation for a still further reduction of price and an increase of illuminating power, and this board had expressed itself willing to agree to a maximum price of 3s. 9d. and an illuminating power of 16 candles. The bill now before Parliament proposed to effect that, but then it immediately created a machinery for unsettling these points from time to time. He believed that it would be better to remain under the Act of 1860 than to accept the bill as now before the committee. They had better rely upon the action of the gas companies themselves, to make a reduction in price when their 10 per cent. was secured. Such being the view of the committee, they would have recommended the board to oppose the bill, and, in fact, stave off legislation for the present year, but for certain special causes which were in operation. The chief consideration with them was the report of the select committee of last session, which seemed to throw upon the board and the Commissioners of Sewers the responsibility with respect to legislation on this question, and there was no doubt that the select committee this session would expect from the board, during the inquiry, some statement of their views as to the measure it would be proper to accede to, and would not be content with a mere opposition of the bill as it stood. In consideration of this position the committee hoped to engraft on the bill some clauses which would be of permanent use, and to obtain the rejection of others which they believed to be mischievous. The object of the clauses which they sought to introduce he would shortly state. The first related to the purchase of the whole of the gas-works of the metropolis, excepting those which supplied the City of London. It did not propose that the board should be compelled to purchase, but that if in their judgment such a step should be considered right, they should within the period of three years have power to agree to do so—*i. e.*, it proposed that the board should have three years to mature their judgment on the question. Every one must confess that at the present time it would be quite impossible for the board to enter upon such an undertaking, and because it would be impossible the clauses in Mr. Morrison's bill were wholly impracticable and inoperative, inasmuch as they required that the board, almost immediately, give notice of their intention to purchase, that it should be done by mutual consent, and that the bargain should not be completed if any one of the companies should stand out. The consequence of that would be that if the board were to arrange with nine-tenths of the gas interest of the metropolis the terms of purchase, the other one-tenth could upset the arrangement by standing out for some extravagant price. The committee proposed the insertion of a series of clauses in the bill, which would enable the board to give notice at any time within three years to the companies to sell their undertakings upon certain conditions. Those conditions, he was quite certain, the gas companies themselves would not object to, and if it was thought necessary that they should sell, he did not think they could possibly ask for more favourable terms. There was an alternative scheme of purchase, either to remit the whole question to the operation of the Lands Clauses Act, as the board was accustomed to do in dealing with other property, or to ask the Board of Trade to appoint three commissioners who should be called "Purchase Commissioners," whose duty it would be to decide the terms of purchase and the mode of payment. If the companies were willing to sell their property and only desired to make fair terms, they would agree to this proposition, and he did not think they would offer any opposition to it. The gist of the whole matter was, whether the board should ask Parliament for power to give such notice within the three years. It was clear, as he had said, that they could not make the purchase now, first, because they did not know the feeling of their constituents upon the question, and he took it that the question was so large, so momentous, and involved so many interests, that it was necessary the board should be well sustained by the ratepayers and consumers of London before they entered upon it. In the next place, it might be that Parliament in its wisdom would, next session, attempt some reconstruction of the board, and either increase the number of members or give them some additional authority; and in either of those cases, it might be necessary that the question of the supply of gas and water should be taken up, with a view either to its future management or the purchase of the undertakings of the companies. If that were possible, the clauses now proposed to be introduced would enable them at any time within three years to put such powers in operation, and thus satisfy, on the one hand, their constituents who pressed for the purchase, or, on the other hand, the Legislature, who threw the duty upon them. If these clauses were not inserted the board would have no power to deal with the question. It must be borne in mind that they only asked for permission. If the ratepayers objected; if the local boards were not willing; if the Legislature did not confer some special authority or impose it upon this board as a necessity, they would not interfere, and after the lapse of three years all compulsory powers would cease. So that the committee were not asking the board to pledge themselves to anything with regard to the purchase; they only recommended them to go before the Legislature and seek permission to put these compulsory powers in operation if they thought fit. The other clauses now submitted referred to those portions of the bill which the committee considered objectionable. The 71st clause of this bill, after fixing the illuminating power and price of the gas to be supplied, proposed the establishment of a revising commission, which would have the power, in January of every year, to go into the whole question of the manufacture of gas, either at the instance of the consumers, of this board, or of the companies. Now, there was no doubt—and it was no use shutting their eyes to the fact—that the companies were always on the alert; they were always well advised, and they had an immense field of evidence at their disposal. There were thirteen companies in London, with thirteen engineers all prepared to give evidence before any committee or commission in support of the companies, and it was quite clear that neither the board nor the consumers could ever compete with them in point of evidence. And yet year by year they would be cited before commissioners appointed by the Board of Trade to consider these questions; and if the companies could show, as they easily could, that 10 per cent. could not be paid at existing prices, that the improvements in manufacture had not kept pace with the obligations imposed upon them by the Act of Parliament, they would get back again to the old prices, notwithstanding the reduction had taken place under the clauses of the Act. At all events, whether that were done or not, it would be unwise to permit a scheme of legislation which might be turned to such purposes, and which, looking to the vast interests concerned, would certainly be turned to that account. Under these circumstances the committee did not feel justified in going before the House of Commons simply to object to the bill as it stood, because they might be asked, and undoubtedly they would be asked by the chairman of the select committee, "Why do you object?" and "If you object, what do you propose as a substitute?" They must, therefore, be prepared with clauses, and the committee felt that the board would hold a very humiliating position, after the report of last session, if they were not prepared to submit something else. These clauses had been prepared with the special view of answering the inquiry on this point, and if adopted, the solicitor, parliamentary agent, and counsel of the board would go before the select committee and say, "We object to this bill, because it is crude and impracticable, and we are prepared to submit a series of clauses, which will make it what we think it should be in the interests of the public without at all injuring the interests of the gas companies." Indeed, he questioned very much whether the clauses were not drawn up very much more in the interests of the gas companies than those in the bill of Mr. Morrison, and he hoped the companies would see that the board had no desire to confiscate their property, or to deal adversely with them, either under the system of purchase or in the control proposed to be exercised over them. He thought it was the duty of the board, under the circumstances, to promote something—not a bill, for that was impossible, but clauses such as these, with a view to make the existing bill what it ought to be. He did not know what the committee might think of the position the board would occupy in taking so large a share in moulding the bill into proper shape, without being the actual promoters, or without standing, as it were, upon the first step of responsibility. That, however, they must leave the committee to deal with. They clearly answer the questions put to them, and having failed to promote a bill themselves, and appearing only in opposition to legislation proposed by others, they must be prepared to introduce something which would make this bill a workable bill, and one which would be a benefit to the consumers.

Mr. SILAS TAYLOR proposed the following amendment—"That the solicitor and parliamentary agent of the board be instructed to request the select committee of the House of Commons to postpone all legislation on the subject of the gas supply of the metropolis until the next session of Parliament, in order that in the meantime the views of the vestries and district boards on the subject may be ascertained." He considered that the vestries and district boards were entitled to be heard before this board proceeded so far as to adopt the clauses recommended by the committee. It was a matter in which they were deeply interested, and he was quite sure they would be surprised if the board came to such a resolution before an opportunity had been afforded for considering the proposals. The board had only had the clauses before them since eleven o'clock that day; but, apart from that, he objected entirely to the board going to the House of Commons, not to promote a bill, but to take up a bill promoted by a gentleman who had been agitating the whole metropolis for many years greatly to the expense of the ratepayers generally, as the vestries knew to their cost. With reference to the bill promoted by Mr. Beal, and brought in by Mr. Morrison, the whole gist of it was that he might be paid the expenses he had been put to last year and this year. Whether the consumers of gas were benefited or not was entirely out of the question. Was the board prepared to come forward at the tail-end of the matter, and try to amend this bill? It certainly appeared to him that they ought not to do so without consulting the ratepayers.

Mr. SHAW seconded the amendment. He quite admitted that the board were in a dilemma, and he considered that they ought to have come forward sooner and promoted a bill of their own. Having neglected to do so, it rested

with them to see that, in whatever step they took, they adopted the lesser of two evils. If the board adopted the first clause, which was to give them compulsory powers of purchase, he could see that great difficulties would arise. There was a great difference between the interests of the gas consumers and the ratepayers. A consumer might be a very small ratepayer—a ratepayer might be a very small consumer. But if, under one of these clauses, the board chose to purchase the gas-works, and had to raise the necessary funds, the ratepayer who might be a very small consumer would have to contribute towards the payment of the money or the making up of the dividends to the company, while the large consumer would hardly be taxed at all. Then, supposing it was not considered desirable to purchase, the difficulty was this, that they would be in a worse position than if they had no Act at all. They would be at once thrown back upon the clauses of the Act of 1860, and the Board of Trade might appoint three commissioners to determine the price and illuminating power of the gas, which, no doubt, would be settled less favourably than at present, because the principle was admitted that the companies were entitled to their 10 per cent. Under these circumstances it was far better to adopt the amendment, and have the subject thoroughly ventilated before doing anything. It was no use for them to adopt this bill, and raise a clamour against themselves throughout the metropolis. They had better wait, and reserve their opposition till the bill came before the House of Lords, rather than assist to amend a bill which most assuredly would not be approved by the ratepayers generally.

Mr. Brushfield, being opposed to all action on the part of the board, could not assent to the amendment, which sought to postpone the consideration of the question, with the view to its being hereafter taken up. For his part he believed the board had quite enough to do already with other matters, and had no right to interfere with either the supply of gas or water. Mr. Newton had talked about having this business thrust upon them. It was nothing of the kind; they were voluntarily placing themselves in the position to gain by force the property of the gas companies. The bill of Mr. Beal, as it stood, objectionable as it was, asked only permissive powers; the clauses proposed by the committee to insert in that bill sought to compel the companies, at the will of the board, to sell their undertakings. He would advise them, before adopting such a proposition, to make themselves masters of the subject, and, if they did so, he was persuaded that, in the interests of the consumers, they would resolve not to take the step. He regretted exceedingly to see the board associating themselves with such men as those who, for the sake of putting something into their own pockets, had been agitating this question. If they would only let the gas companies alone, and not compel them to be constantly expending money to protect themselves from these assaults upon their property, there would be a reduction in the price of gas before the period mentioned in the bill. But, while these expenses were going on—expenses which, though at first borne by the companies, must ultimately fall upon the consumers—the period for reduction of price was necessarily postponed. He had already stated it as his conviction, from the knowledge he had acquired upon the subject, that 18-candle gas at 3s. 6d., which was what the board stated to Sir Stafford Northcote ought to be given, never could be supplied in London. And Mr. Newton had himself admitted that he knew it could not be done, and that they must bate a little.

Mr. Newton denied that he had said anything of the sort.

Mr. Brushfield said he took down the words as they came from Mr. Newton's own lips.

Mr. Newton asserted that he never said anything of the sort, nor anything that by possibility could be so construed. What he said was, that though the board on a previous occasion fixed upon 18 candles illuminating power and a 3s. 6d. price, he knew at the time it was more than they could have done. He said so at the time, and never voted for that proposition.

Mr. Brushfield did not think he had at all misstated what Mr. Newton said, which was that he knew at the time the proposition was made by the board it could not be done. Sir Stafford Northcote asked the board how it could be done, and the board were unable to reply, and thus placed themselves in a most humiliating position. He (Mr. Brushfield) defied them to do it, and why, then, should they persist in going to Parliament on what he could not help calling false premises, in order to establish a case against the gas companies? He might say a good deal in defence of the rights of the companies to their 10 per cent. dividend, considering the precarious nature of their trade, but he would forbear, and content himself with urging upon the board, for the sake of their own dignity, if not with an eye to the interests of the ratepayers and consumers, to make themselves somewhat better acquainted with the subject before they interfered with the companies, or attempted to engross in their own hands the supply of gas to the metropolis.

Mr. Healey was perfectly at a loss to understand the position taken by Mr. Newton. That gentleman introduced the subject by a long speech, in the course of which he expressed his dissatisfaction with the Act of 1860 as being too much in favour of the gas companies, and his dislike of Mr. Beal's bill because it was unworkable, and yet he recommended the board to adopt a series of clauses which he stated was more in favour of the companies than either. He (Mr. Healey) believed that if the board were going to become the purchasers of gas-works and the manufacturers and sellers of gas, they might just as well take up with the trade of every joint-stock company in the metropolis. For his own part he thought with Mr. Brushfield that, whatever might have been the case in times past, the consumers of gas had not much to complain of now. But the board had put themselves in a fix, and now, at the eleventh hour, they were asked to adopt a course which there was no time to consider. He, therefore, thought it far better to adopt the amendment, or to content themselves with a simple opposition to the bill.

Mr. Hall said he should support the amendment if he had the slightest idea that it could be carried out; but after the recommendation of the select committee of last session he believed such a proposition would be scouted. If the clauses now proposed were inserted in the bill it would give the board breathing time—there would be three years to consider whether they would purchase, and five years before they would have to carry it out. By that time they would be able to decide as to the best course to pursue; at present his opinion was that it would be well for this board, or some similar body, to have charge of the supply both of gas and water. If the business of the gas companies was so precarious, he was at a loss to know why they objected to the board taking to it; if it were otherwise, he thought it would be better to have it in the hands of a public board, and apply the profits for the relief of the ratepayers.

Mr. Freeman, replying to Mr. Brushfield, expressed his doubts whether the gas companies were so economically managed that no improvements could be introduced. He remembered that precisely the same thing was said in reference to the management of the Fire Brigade, whereas the accounts showed that since it had been vested in the board there was a saving of from 20 to 25 per cent. in everything which was bought. He would ask Mr. Silas Taylor in what dilemma the board would be placed if they adopted his amendment. Did he suppose that the committee of the House of Commons would assent to the proposal for a postponement? And then it must be remembered that the bill introduced by Mr. Morrison was already before the committee. They all knew that it was a bad bill, and yet if the amendment were carried they would be unable to do anything with it. They would not have sanctioned any clauses or amendments of their own, and was it supposed that if they did not appear to oppose they would escape from the last clause of the bill as it stood? So that the effect would be that they would have a bill passed into law which they believed was unworkable and impracticable, and would be saddled with the costs of the inquiry last year and this.

Mr. Savage could not support the amendment, because it seemed to pledge the board to promote a bill next session; and the difficulty he felt about the motion was, that by the proposed clauses the board were holding out the idea that they meant to purchase the works of the companies. Would they not be asked by the committee, "What do you mean by clause A?" He would rather the board came by a distinct vote to a decision as to what they really intended to do before they proceeded further in the matter.

Dr. Evans said there could be no doubt the whole object of the clauses was to give the board the power to become purchasers of the gas-works and to manufacture gas. There was no attempt in them to secure an improved quality or a lower price of gas; in fact, the one idea was to put the board in possession of the works. He thought it was pretty clear that the board could not manufacture gas cheaper than the companies. They might suppose it possible to effect some economies; but, after all, they must have managers, and engineers, and other officers, and if they paid them at the same rate as they paid those who were already in their employ, there would be very little saving in that direction. Mr Newton, in moving the adoption of the report, did not put forward the clauses proposed as in any way more likely to benefit the consumers than the bill as it stood; and, for his own part, he (Dr. Evans) did not believe that they would be at all benefited thereby. Mr. Newton very candidly admitted that the companies had diminished the price and increased the illuminating power of the gas during the last few years, and there was no doubt that this would continue if the companies were not interfered with. He could have understood the clauses if they had contained anything which was likely to be a benefit to the public, but they did not do anything of the kind. The board had already placed themselves in an undignified position by proposing to Sir Stafford Northcote that gas should be supplied in London, of 18 candles illuminating power, at 3s. 6d., without having a tittle of evidence to show that it could possibly be done, as the mover of the resolution himself acknowledged. Nor were they in a dignified position in now coming forward with the intention of becoming purchasers of the gas-works and supplying gas, without a particle of evidence that they could do so with advantage to the ratepayers. Talk of reducing the rates! He believed that the moment the board became gas manufacturers they would have to raise rates in aid of the manufacture, instead of handing over profits in aid of the rates. There could be no doubt that, in the interests of the ratepayers and for the credit of the board, it would be much better to let this question alone. They had been accused of grasping at all sorts of things which did not properly belong to them, and he could not help thinking the accusation would be justified in the present instance.

Mr. Newton replied, and said the primary object of the opposition of the board was to strike out the revising clauses of the bill, as they denied the right of the Board of Trade to appoint an irresponsible commission to impose such terms as they saw fit in respect to price and quality. The board did not ask for compulsory powers of purchase further than this, that if within three years they found themselves in a position to give notice to the companies they should be able to do so. They did not pledge themselves in any way to undertake the purchase. He thought the board would occupy a very undignified position if they adopted the amendment, and asked the select committee of the House of Commons to postpone legislation until St. Pancras had been consulted on the subject.

The amendment was then put to the vote, and negatived. A division was called for, when there appeared—

For the amendment	4
Against	13
Majority against	9

On the original motion being put,

Mr. Healey submitted another amendment, to the effect that clauses A and B be left out. The first of those clauses related to the compulsory powers of purchase, and the second to the mode in which the purchase should be carried out. In reference to Mr. Newton's last remark, he maintained the right of St. Pancras or any other parish to a voice in this matter, and protested against the board, when driven up in a corner, and at the eleventh hour, entering upon a project which would be so costly to his constituents.

Mr. Nicholay seconded the amendment. The vestry of St. Marylebone, which he represented, had resolved unanimously to present a memorial to the board against the proposal to purchase the gas-works and become traders in gas. He regretted that so important a question as this should be discussed in so small a board, and thought that, instead of hurrying on a decision, an opportunity should be given to the vestries and to the ratepayers to express their views upon it.

Mr. Shaw and Dr. Evans supported the amendment.

On a show of hands, the amendment was negatived.

The original motion was again put, and on a division there appeared—

For the motion	10
Against it	8
Majority for	2

The board then adjourned.

St. Olave's (Southwark) District Board of Works.

At the Meeting of this Board, on Tuesday, the 21st of April—Mr. Shand in the chair,

The Clerk (Mr. Robert Slee) reported that, by direction of the General Purposes Committee, he had drawn a clause for insertion in the gas bill now before Parliament, and which had been taken charge of by the Metropolitan Board of Works. The clause was as follows:—"That every vestry and district board shall have the power to affix a meter to one lamp in every twelve of the public lamps, for the purpose of ascertaining the average quality of gas consumed by all the public lamps in the parish or district under the control of such vestry or district board; and the consumption of such one lamp shall be taken to be the average consumption of the eleven other of such lamps, and be paid for to the company in accordance with the consumption of such one lamp, so that the quantity actually consumed shall be paid for to the company: provided always, that every lamp so to be tested shall be fitted with similar apparatus as the one to which the meter shall be attached." He said he forwarded it to the Metropolitan Board of Works, and received a reply from the solicitor, asking him if the 93rd section of Mr. Morrison's bill would not answer the purposes of the board. He also inquired whether the clause was intended for insertion in that or in Mr. Wyatt's bill. The bill it was intended to be inserted in was Mr. Morrison's, and the 93rd

section of this would not meet the requirements of the board. It provided that the company might affix to any street-lamp an instrument called a "governor." There was, however, a wide distinction between a governor and a meter, and they did not both answer the same purpose. He had forwarded a copy of the clause and of the above correspondence to Mr. Locke, whose name was on the back of the bill, who had promised to lay it before the select committee when it met. If the clause passed it would be a great protection to the board. The companies did not like the board lighting and extinguishing the lamps, as this was too great a check on them.

Mr. LYELL asked who would have control of the meters.

Mr. CLERK replied, the board, who would place them in the charge of the inspector.

Mr. LYELL thought the companies would object to that.

The CLERK had no doubt about it. A general clause must be got, and the working out of it must be left till afterwards. The companies would be sure, for their own protection, to secure power to inspect the meters, and to see that they measured correctly. It would be for the interests of both the companies and the consumers to see to this.

The board approved of the steps that had been taken.

CITY OF LONDON COURT OF SEWERS—TUESDAY, APRIL 21.

At the Meeting of the Commissioners—Deputy DE JERSEY in the chair,

Mr. BONTEMS informed the court that a bill had been introduced into the House of Commons by Mr. Morrison, and promoted by the delegates of the metropolitan vestries, for regulating the metropolitan gas supply, and in it the Commissioners of Sewers were made the local authority for the City. He explained that this provision was entirely different to that contained in the bill introduced by the corporation, whereby it was proposed that the civic body should be the local authority for all purposes under the Act. In the present bill there was a clause to enable the commissioners to mortgage the rates to enable them to use the compulsory powers contemplated. The Special Gas Committee of the corporation, of course, had not committed the commissioners to any course of action, and he thought it right to call their attention to the steps that were being taken in the matter.

The CHAIRMAN asked if any additional rating power was to be given under the Act to the commission, as they were already restricted to the making of a 1s. 6d. consolidated-rate in the year.

Mr. BONTEMS replied that he did not think such additional powers were given, but attention should be paid to the subject, and, if necessary, clauses would be submitted.

THE PROPOSED WATER SUPPLY FOR THE METROPOLIS.

By DR. FRANKLAND, F.R.S., &c., &c.

[A Lecture delivered at the Royal Institution of Great Britain, Friday, April 3, 1868.]

Out of every thousand people existing upon this planet at the present moment three live in London. Any matter, therefore, which intimately concerns the health and comfort of this vast mass of humanity cannot but merit earnest attention, and if, moreover, that matter be connected with scientific research, I feel sure that the members of this institution will require no apology even for its being brought under their notice a second time. A year ago, I discoursed to you about the chemical considerations respecting the present metropolitan water supply, and I mentioned the five schemes then proposed to remedy its obvious and serious defects of excessive contamination with sewage, and great hardness—the first rendering it unfit for drinking, and the second disqualifying it to a certain extent for washing and cleansing purposes. Those schemes to which I alluded on the last occasion were the following:—First, the sources of the Severn, proposed by Mr. Bateman; secondly, the Cumberland lakes, proposed by Messrs. Hemans and Hassard; thirdly, the Thames water filtered through the Bagshot Sands, suggested by Mr. Telford Macneill; fourthly, extensive reservoirs constructed near the sources of the Thames, the scheme of Mr. Bailey Denton; and, fifthly, the waters flowing down the slopes of the Derbyshire and Staffordshire hills, proposed to be brought to the metropolis by Mr. Remington.

At that time the quality of the water obtainable by any of these schemes had been but little investigated, and that remark still applies to the last three schemes. But, in the interval, the water yielded by the two first-named districts has been, at the instance of the Royal Commission on Water Supply, submitted to a searching chemical investigation by Dr. Odling and myself, and I am therefore enabled, on the present occasion, to speak with confidence as to the quality of the water from both these districts. There are also one or two points of general scientific interest which have been brought to light during this inquiry, and which I also propose to touch upon. These are, first, the curious effect of detritus from mines upon the quality of the water with which it is mixed; and, secondly, the conditions which determine the action or non-action of water upon lead.

During the past year the processes of water analysis have undergone a complete revolution. It is one of my duties to report monthly to the Registrar-General upon the quality of the metropolitan waters, and, in carrying out this work, I found the methods of analysis hitherto employed so untrustworthy as to render an almost entire remodelling of them absolutely necessary. I propose, therefore, first to glance shortly at some of the innovations which have been made in this branch of chemical analysis. When water is to be submitted to analysis, it is of the utmost importance to have a sufficient and well-collected sample. On this occasion, the completeness of the investigation as regards the two proposed schemes has been very materially assisted by the judicious choice of samples supplied by Dr. Pole, F.R.S., who went down to the districts and collected the samples, which were afterwards submitted to chemical analysis by my colleague and myself.

The first thing to be determined in a water analysis is the "total solid impurity," as it is termed—*i. e.*, the total amount of solid matter with which the water has been contaminated since it was submitted to the natural process of distillation. This quantity of solid impurity is determined by taking a known volume of the water and evaporating it down to dryness in a previously weighed platinum vessel. The solid impurity contains both organic matter and inorganic or mineral matter. The most important of these two classes of substances contained in the residue is undoubtedly the organic matter. Now, even at the present moment the actual weight of this organic matter cannot be determined by chemical analysis; in fact, there is no process known to science by which its weight can even be approximately estimated. But it is possible to determine, in a given bulk of water, the quantity of the two principal constituents of this organic matter—viz, the carbon and the nitrogen—which enter into its composition. For this purpose a separate quantity of the water is evaporated down to dryness, but in this case the process is conducted in a glass vessel, and before evaporation the water is mixed with sulphurous acid in order to expel the carbonic acid, which is partly dissolved in the water and partly combined with lime and magnesia. Other precautions also have to be taken, but I hesitate to enter into the details, which I fear would only weary you. However, I think that it is desirable just to show you the general plans on which the determination of the organic carbon and nitrogen in the residue, thus obtained by evaporation in the glass dish, is effected. The operation is performed in the following manner:—The contents of the glass vessel are very carefully scraped out and rubbed off the sides by a substance known as chromate of lead—a finely powdered, somewhat gritty substance, which very completely effects this object, and enables us to transfer the water residue gradually into a piece of hard Bohemian glass tube. This tube is then filled up to within about four inches of the mouth with coarsely granulated oxide of copper, and upon that is placed a small quantity of bright metallic copper to decompose the oxidized compounds of nitrogen. The tube is then placed in a gas furnace, called the combustion furnace. Before combustion commences the entire tube is made perfectly vacuous—all the air is pumped out of it so as to get rid of the atmospheric nitrogen, which would vitiate our result. This is done by means of a mercurial pump, invented by Dr. Sprengel, by which we can extract almost the last trace of atmospheric air contained in the tube. The latter is then gradually heated to redness, during which process the carbon and nitrogen of the organic matter in the water residue are converted, the first into carbonic acid gas, and the second into nitrogen and nitric oxide gases. From the volume of each of these gases the weights of carbon and nitrogen can be calculated with great precision. [Experiment performed.]

Now, the nitrogen in the result of the analysis is also derived from any ammonia present in the water, and it is, therefore, necessary to determine how much is due to that source. This estimation of ammonia is, perhaps, the only *rapid* and *easy* process of water analysis which may be regarded as satisfactory. For these simple processes of analysis, when they come to be rigorously tested, generally prove to be very incorrect, but this has survived the test of experience, and is capable of determining the result with great precision and readiness. I have here five glass cylinders. The water in the first contains no ammonia at all; the second contains a certain small quantity; the third twice as much as the second; the fourth three times as much; and the fifth four times as much as the second. To each of these vessels I shall now add an equal volume of a test solution, which strikes a peculiar yellow or orange yellow colour with the ammonia in the vessels. This is known as the Nessler test, having been invented by a German chemist of that name. [The experiment was performed, the water in the four last vessels assuming different shades of orange colour in proportion to the quantity of ammonia contained in them, the water in the first vessel remaining colourless.]

Now, we have still one other process which it is necessary for a moment to glance at—viz., the process for determining the nitrogen existing in the water as nitrates and nitrites. It is called combined nitrogen, but it is not organic nitrogen, although it has in most cases been derived from organic matter. The water residue used for the determination of the amount of solid impurity is dissolved in a small quantity of water; sulphate of silver is then added, by which its chlorides are converted into sulphates. The resulting liquid after filtration is transferred to the upper part of a tube filled with mercury. It requires to be mixed with rather more than its own weight of sulphuric acid, which is introduced in the same way. It is then only necessary to shake up this mixture, the mouth of the tube being closed with the thumb. Very soon the mercury begins to act on the nitrous and nitric acids, which it converts into a colourless permanent gas called nitric oxide, which only requires to be measured in order to determine the amount of nitrogen in the shape of nitrites and nitrates.

There is only one other determination I will trouble you with, and this I do principally for the purpose of introducing to your notice a very ingenious piece of apparatus, a modification of the Sprengel pump, which has just been contrived by my assistant, Mr. M'Leod. It is designed to extract the gases which are dissolved in waters. By this instrument we can not only measure the whole of the gases present in the water, but we can determine how much of the gases can be expelled at the ordinary temperature, and how much more will come off when you boil the water *in vacuo*. This gas is then submitted to the usual endometrical investigation, to ascertain the quantity of carbonic acid, nitrogen, and oxygen—the three gases which almost invariably occur in the waters submitted to analysis. [Apparatus shown at work.]

Now, it is not necessary for me, on the present occasion, to go at all into details as regards the sources of the two proposed water supplies of London. This I did, on the former occasion, pretty fully. I will only refer you for a moment to the large map before you, which shows the districts from which the supplies would be taken, and the course of the conduits to the metropolis. By the Welsh scheme the water would be collected on the slopes of Cader Idris and Plynlimmon, from whence it would be brought by a conduit to within 10 miles of London, where it would be stored in reservoirs 400 feet above high-water mark. The other scheme proposes to bring the water from the lakes of Cumberland, past several large towns, and laying under contribution the Bala Lake, in Wales, if necessary; and the combined waters would be brought to the metropolis, after distributing a certain amount to the large towns on their route.

It is, perhaps, necessary to say a word or two in order to disabuse your minds of the idea that these schemes are intended to inflict any injury upon the present water companies. Ample provision is made in these schemes for the complete compensation of the existing companies, and the only conceivable mischief, in this respect, which could be done by the adoption of the one scheme or the other, would be the abolition of certain boards of directors which now exist for the administration of the affairs of the eight or nine companies which supply London.

These schemes are, of course, very costly. It quite staggers one at first to think of the amount it is proposed to expend upon them. Thus Mr. Bateman's scheme, which is to bring water from the mountains of North Wales, is calculated to cost, for a supply of 220 million gallons per day, the sum of £10,850,000; whilst the scheme for bringing water from the lakes of Cumberland is put down, for 250 million gallons a day, at £13,500,000. Now, these are startling figures, but I imagine all we have to look at is the simple fact, how much shall we have to pay for the water when these schemes are carried out. If you go into that matter you will find, according to the calculations of the engineers (I will not say they are always to be implicitly relied upon—perhaps a certain per centage must be allowed—but taking their calculations as correct), it actually follows that, after compensating the existing companies, and after spending this enormous sum upon the works, we shall be supplied with this very pure water at a less cost than we are supplied at the present moment. We pay, at the present moment, about 1s. 5d. in the pound for water. By Mr Bateman's scheme it would be accomplished by a domestic rate of 10d. in the pound, or two-thirds of what we now pay, plus a public rate of 2d. Messrs. Hassard and Hemans' scheme would be met by a domestic rate of 1s. 1d. in the pound. Now, I think, if we are actually to be gainers by this trans-

action, the enormous sums necessary to be expended upon these works need not frighten us, and need not prevent us taking them into our serious consideration.

Let us just pause for a moment to consider the purely mechanical relations of the proposed to the present metropolitan supply, because this will somewhat help you to comprehend how it is that, having expended all this money upon the works, we shall still have water cheaper. In the first place, every gallon of water which is now delivered in London has to be pumped up from nearly the sea level to a height of about 250 feet. Then, again, the present system is intermittent; the proposed system will be constant. With regard to the pumping part of the process, that in the proposed scheme would be replaced by the work of gravitation. The gigantic and magnificent engines employed at the present moment in London for raising this vast volume of water—100 million gallons a day—are painful to contemplate by the philosopher. You have here a stupendous waste of power, employed in doing over again an amount of work which was previously executed for us gratuitously. The sun, in his prodigality of power, flings up far above the cross of St. Paul's this daily supply of 100 million gallons, and we, in our imbecility, allow it to soil itself by flowing down again nearly to the level of the sea, and then we erect immense pumping-engines, and expend 200 tons of coals daily, to raise this water a fraction of the height which we had previously allowed it to fall. All this will be saved by the proposed schemes.

We talk of the exhaustion of our coal-fields, and of the necessity of conserving our supply as much as possible; and, although the amount thus saved would make but a poor figure in Mr. Jevons's 100 million tons a year, yet this is a kind of work which can be done better by solar heat than by the action of coal, and it is not often that we are thus able to substitute with advantage natural for artificial force.

Now, with regard to the quality of these waters which it is proposed to bring to London. You have in the following table a comparative statement of the results obtained by the analysis of the proposed Welsh and Cumberland waters and of the present metropolitan water supply:—

Results of Analyses of Welsh, Cumberland, and London Waters.

100,000 *Parts of Water gave*—

	Welsh.			Cumberland.			London.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
Total solid impurity .	9·60	2·790	4·85	13·60	2·14	4·74	59·20	23·12	32·66
Organic carbon.....	1·04	·200	·460	1·059	·066	·276	1·020	·064	·270
Organic nitrogen	·013	·000	·006	·068	·000	·010	·082	·000	·025
Ammonia.....	·008	·000	·003	·006	·000	·002	·120	·000	·003
Nitrogen as nitrates and nitrites	·068	·000	·017	·045	·000	·009	·564	·054	·323
Tot. combnd. nitrogen	·069	·002	·025	·088	·003	·021	·578	·059	·354
Previous sewage or manure contamination	360	0	47	140	0	6	5330	230	2930
Hardness	3·0	·4	1·4	8·0	·7	2·2	30·0	15·4	20·13
Lime	1·126	·217	·599	3·096	·361	1·113	16·3	8·170	9·822
Magnesia	·404	·144	·288	·727	·111	·272	1·048	·754	·890
Potash	·243	·053	·126	·267	·063	·158	·964	·734	·851
Soda.....	·916	·490	·679	·683	·356	·532	2·240	·834	1·666
Sulphuric acid.....	1·746	·290	1·093	1·941	·020	·969	4·650	2·683	3·674
Carbonic acid	·614	·000	·201	2·276	·163	·691	8·524	5·517	7·187
Silica.....	·581	·026	·254	·221	·061	·133	·899	·715	·834
Chlorine	1·487	·573	·876	·653	·130	·490	1·526	1·413	1·480

The quantity of the solid impurity contained in a water is a very important matter, apart from the consideration of the quality of the substances which compose this impurity. Waters leaving a small amount of residue upon evaporation are usually well fitted for domestic use. They are invariably the best for manufacturing purposes, as they effect a great saving in heat when used for steam-boilers. I was shown the other day some cakes of carbonate of lime, a quarter of an inch thick, which had been removed from a locomotive boiler at the Deptford railway station, in which they had been formed in 48 hours. Through this incrustation heat passes with extreme slowness, so that a considerable quantity of fuel is wasted.

It will be seen, from the above table, that on an average of all the samples, the total solid impurities amount, in the two schemes, to about 1-5th of those in the present water supply; but if we might venture to take the water in the large storeage reservoirs proposed as equal in this respect to the water now stored in the lakes, it would be about 1-10th of that which is found in the London waters.

Now, this solid residue is partly mineral and partly organic. Let us glance first at the organic. This organic matter, present in the original water, may be either living or dead. The detection of the former class of impurities belongs more to the province of the naturalist than to that of the chemist; but it may be remarked, in passing, that this form of organic impurity must necessarily be in suspension and not in solution. We cannot conceive of organized beings existing in solution—it is impossible. But it does not from this follow that these suspended matters can be removed from water by filtration. It is well known that the ova of many species of animalculæ cannot be removed thus, they pass through the best filters, and it has also been proved that what is believed to be the cholera poison passes through filters and cannot be arrested. This is a most important consideration in connexion with water which is contaminated with sewage and manure matters, and it is necessary that such water should at all events be as well filtered as possible. The present water companies supplying London cannot possibly be blamed for the original quality of the water which they supply. They cannot hinder the 600,000 persons who live on the banks of the Thames from pouring their refuse into the river, but they can filter this impure water. They can, and indeed by Act of Parliament they are supposed to be compelled to deliver this water in a bright, transparent, and filtered condition; and they can in this way, as far as it is possible by filtration to do it, remove these suspended organic contaminations from the water.

But how does the matter stand? Here is a sample of water which I drew from the Lambeth Company's main on the 4th of March. You see that the water is not filtered. It is filtered by Act of Parliament; but it is curious to observe that so much pollution can pass through an Act of Parliament. Here, too, is a sample of the same company's water collected on the 21st of January, and it is a fact that during the whole of that interval, and almost up to the present time, this water has been much in the same condition. Those of my audience who are supplied by the Lambeth Company, or the Southwark and Vauxhall Company, or by the Chelsea Company, will bear me out as to the condition in which those companies have delivered water during the past two months. In short, not only for the past two months, but during the entire year, water is often delivered in London very imperfectly filtered. The Southwark Company, during the whole of last year, with one exception, delivered from its mains turbid water imperfectly filtered. Most of the other companies were to a less extent guilty of the same thing. Of the companies which draw from the Thames, the West Middlesex and the Grand Junction are the two which filter their water best; but the only company which delivers water uniformly transparent and well filtered is the New River Company.

I have stated that the absolute quantity of the organic matter in solution in water cannot be ascertained, but the amount of carbon and nitrogen contained in this organic matter can be estimated by the process of combustion which I have exhibited to you. The amount of organic carbon and nitrogen in the several waters I have referred to is represented in the second and third lines of the above table, and you will see that with regard to these elements of the organic matter in solution there is not a very striking difference between the three different classes of waters. There is an excess of organic nitrogen in the case of the London waters, and of organic carbon in the case of the Welsh waters. The organic matter of which the elements are thus determined may be either animal or vegetable, and the nature of it has much to do with the probability of its being noxious or innocuous. The animal or vegetable source of the organic matter may be judged of by the proportion of nitrogen to carbon as determined by analysis—that from animal sources contains a larger proportion than that derived from vegetable sources, and in this way it is easy to see that the organic matter in the Welsh and Cumberland waters is of a different character to that contained in the London waters. The London river waters, especially when turbid, contain a much larger proportion of nitrogen to carbon than is contained in the other waters, thus proclaiming the animal origin of some portions of the organic matter. Now, in connexion with this subject, the investigation of the Welsh and Cumberland waters revealed a very curious effect, produced by the admission of the detritus from lead and other mines into the waters of the streams and lakes. It was found upon analysis that water thus mixed with the streams from the crushing-engines of mines contained a wonderfully small quantity of nitrogenous organic matter. You will see this brought out in the following table:—

Effect of Detritus of Lead Mines upon the Organic Matter in Water.

	Organic Carbon in 100,000 Parts of Water.	Organic Nitrogen in 100,000 Parts of Water.
Cumberland Waters—		
Glenridding Beck	·116	·000
A stream flowing into Thirlmere .	·066	·001
Goldrill Beck.	·262	·001
Welsh Waters—		
Ceryst.	·209	·000
Upper Clywedog	·544	·000
Lower Clywedog	·242	·001
Tarrannon and Ceryst	·304	·001

This table shows that, whilst some of these waters exhibit a rather large quantity of organic carbon, they contain very little or no trace of organic nitrogen. And, further, these waters, though they hold in solution a considerable amount of peaty matter, are perfectly colourless when seen in a quart decanter; but, when viewed through a stratum 15 feet thick, they exhibit the magnificent blue-green tint of absolutely pure water, a tint which is also brought out when water is passed through animal charcoal. We may illustrate the action of this crushed quartz of lead mines and of animal charcoal by three samples of the water delivered to the Institution by the Grand Junction Company, and which are contained in the tubes before you, each of which is 15 feet long. The centre tube contains the water just as it passes into the cistern; the water in the second tube has been shaken with powdered flint; whilst the water in the third tube has been passed through animal charcoal. If we now send through each tube a parallel ray of electric light, which ray will have to pass through a stratum of about 15 feet of water, you will perceive that the first gives a yellow-brown tint upon the screen, the second a beautiful green tint, and the third a turquoise colour, the last two powerfully reminding the observer of the lakes of Lauerz and Zug, as seen from the summit of the Rigi. [Experiment performed.] In fact, this is doubtless the chief cause of that magnificent colour which we witness in many of the Swiss lakes, and which we see, for instance, in the Rhone when it leaves the lake of Geneva, and the Limmat as it flows from the lake of Zurich. The streams running into the heads of these lakes come in turbid and filled with finely crushed quartz and other rocks, the detritus from the glaciers which are the source of those streams. In the lakes these fine particles of mud subside, and attract to themselves the peaty colouring matter which is to be found in almost all waters. We see in two of the English lakes some indications of this blue-green tint appearing, and it is precisely in the localities where the streams from the lead mines come down into the lakes. You see near the mouths of those milky streams which come down into Ullswater from Glenridding, and from the "Old Man" into Coniston Lake, the indications of this precipitation and removal of those substances which discolour the natural waters of our lakes. We have thus here, perhaps for the first time, evidence of improvement of the quality of water by the admission into it of manufacturing refuse. Hence, instead of having to remove these waters coming from the lead-works, which would seem at first sight to be necessary, their admission into the lakes would be of great benefit to the waters; they would to some extent decolorize them, and would tend to reduce the nitrogenous organic matter to the lowest possible amount. There appears to be no need to fear that such streams will carry anything into the lakes which will be deleterious to the drinker. All these streams have been carefully examined for lead, arsenic, copper, &c., and only in two cases has the veriest trace of lead been discovered, and the quantity was so minute that it is absolutely impossible it could be deleterious even if the water coming from the mines themselves were to be drunk; but, mixed with the larger quantity of the lake water, it becomes utterly inappreciable.

The fatal effect said to be exerted upon fish by these milky streams from mines is most probably due to a mechanical action of the finely divided quartz upon their organs of respiration—an effect analogous to that (but of an exaggerated kind) from which the Sheffield knife grinders notoriously suffer.

Having thus discussed the organic portion of the solid impurity of these waters, let us now turn to the inorganic or mineral portion, which may be conveniently divided, as regards its most important constituents, into three subdivisions, viz.:—

1. Soap-destroying substances.
2. Mineral compounds, constituting chiefly the skeleton of decomposed sewage or manure.
3. Poisonous substances, such as arsenic, copper, and lead.

The first, or soap-destroying category of substances, communicates to water the quality called hardness. These substances are the salts of lime and magnesia, and the quantity of them contained in the proposed, as compared with the present, metropolitan water supply, will be seen on reference to the analytical table. The hardening effect of these substances is also

given in a separate line of the same table, from which it will be seen that the proposed is only about 1-10th as hard as the present water supply. Tastes differ as regards hard or soft water for drinking purposes, and medical arguments have from time to time been advanced, now in favour of, and now against each. It has been asserted in this country, for instance, that hard water is necessary for the formation of bone, and that Providence has indicated the superiority of hard over soft water, by covering a large proportion of the surface of our planet with calcareous deposite; whilst M. Belgrand states that the inhabitants of the hard water districts of France notoriously suffer from carious teeth. It would, probably, be extremely difficult to prove either of these assertions. As regards the enormous advantages of soft water for washing, cleansing, and manufacturing purposes, there is, however, no difference of opinion. In Glasgow alone the annual saving of soap only, by the introduction of Loch Katrine water for a previous supply of very moderately hard water, has been estimated at £36,000. Having had the opportunity of comparing a six years experience of the soft water supplied to Manchester with a subsequent ten years experience of the hard water of London, I can state that the soft water was, for all purposes, preferred by every member of my family. On removing from Manchester to London, the repugnance to drink the hard water of the latter city was at least as marked as that which I have sometimes noticed in persons making the transition in the opposite direction.

The hardness of the London waters is chiefly what is termed *temporary* hardness—that is, it is caused by the carbonates of lime and magnesia, the greater portion of which are gradually deposited on boiling the water for half an hour. By reason of this softening of such water by boiling, temporarily hard water is considered to be less objectionable than water of the same degree of permanent hardness. My own experience leads me to the conclusion that the advantages of temporary over permanent hardness have been considerably overrated. In reality water used for domestic purposes is, even when used hot, either not heated to the boiling point, or is boiled for too short a time to remove more than a small proportion of its temporary hardness. Thus water drawn from the kitchen boilers of a dwelling-house and of the Athenæum Club was usually almost as hard as the cold water with which they were supplied, as is seen from the following testings:—

Date and Hour.	Hardness of Cold Water. Deg.	Hardness of Hot Water. Deg.
1867—Sept. 30, 8 p.m.	14·6	13·6
Oct. 1, 8 p.m.	14·4	13·9
2, 8 a.m.	14·4	13·4
3, 9 p.m.	14·6	11·6
4, 8 a.m.	14·6	7·6
7, 8 p.m.	14·4	11·7
8, 8 a.m.	14·4	12·1
9, 8 p.m.	15·4	14·3
10, 8 p.m.	15·9	11·9
11, 8 a.m.	15·9	8·4
12, 8 a.m.	16·1	11·9
Nov. 8, 5 p.m.	18 7	18·4
11, 5 p.m.	18·7	18·6
12, 6 p.m.	18 7	18·4

The amount of soap destroyed by the use of various waters for washing purposes is seen from the following table, in which certain Welsh and Cumberland waters are also introduced for the purposes of comparison:—

Soap Destroyed by 100,000 *lbs. of various Waters.*

	Soap Destroyed. lbs.
Metropolitan Waters—	
Thames water	212
River Lea	204
Kent Company's water	265
Other Waters—	
South Essex Company's water	253
Caterham Company's water	84
Water supply of Worthing	285
" " Leicester	161
" " Manchester	32
" " Preston	80
" " Glasgow (Loch Katrine)	4
" " Lancaster	1
Bala Lake	5
Thirlmere	8
Haweswater	16
Ullswater	23

In the recent supply of water to Paris from new sources, the importance of soft water attracted the earnest attention of the engineer, M. Belgrand. A close investigation of the available sources, however, soon showed that he had, unfortunately, but little choice, as the really soft streams of the Fontainebleau sands and of the granite of Morvan were mere driblets. Hence the river Vanne (17° to 20°), somewhat softer than the Thames, was the softest available source; and, having first conclusively demonstrated this, he consoles the Parisians by saying, "Les eaux du granite, du greensand et des sables de Fontainebleau, qui sont chimiquement plus pures, sont beaucoup moins agréables à boire."

The second category of inorganic substances contained amongst the solid impurities of waters consists of *the mineral compounds constituting chiefly the skeleton of decomposed sewage or manure.* The putrescible nitrogenous organic matters present in water, or in the soil through which water percolates, undergo gradual oxidation and decomposition, by which their carbon and hydrogen are converted into carbonic acid and water, and their nitrogen into ammonia, nitrous and nitric acids. The last three remain in the water, constituting a record of previous contamination with putrescible nitrogenous organic matter. But rain water always contains ammonia, and, as Dr. Bence Jones has shown, also nitrous and nitric acids. The nitrogen in these forms in rain water, as it finds its way into rivers and springs, amounts in the aggregate to ·032 part in 100,000 parts of water, therefore this amount must be deducted from that found on analysis as nitrogen derived from aërial sources. The remainder, if any, represents the nitrogen derived from putrefied nitrogenous organic matters with which the water has been in contact. To express this in terms of some known standard, I employ average filtered London sewage, which contains 10 parts of nitrogen in the form of putrescible organic matter in 100,000 parts. Thus a water which contained 1 part of nitrogen in 100,000 as nitrous acid, nitric acid, and ammonia, would contain in 100,000 parts the nitrogenous remains or skeleton of an amount of putrescible organic matter equal to that contained in 10,000 parts of average filtered London sewage. Such a water is, therefore, said to have a previous sewage contamination of 10,000 parts in every 100,000 parts. But it may be asked, Is this a true record of the previous history of the water in this respect? I believe it to be so, as far as it goes. I believe that this nitrogen as truly represents a quantity of previously existing putrescible organic nitrogenous matter as that the bones of a megatherium demonstrate the previous existence of an individual of that species; but as the geological record of previous existences is imperfect, so is the nitrogenous record. Just as chemical and mechanical agencies have broken up and dissipated the remains of millions of animals during long geological periods, so does the action of growing plants, and, perhaps, also of living animals remove from water in a few hours or days some portions of this skeleton of previous putrescible organic matter. Thus, by storeage in large reservoirs, the East London Company reduced the previous sewage contamination of the river Lea last summer from about 2000 down to 230 parts in 100,000. The previous sewage contamination of a water as determined by analysis is, therefore, a minimum quantity.

But in addition to the aërial, for which due allowance is made, can there not be some other source of this skeleton than putrefied sewage or manure matter? Can it not be derived from putrefied vegetable matter—from peaty matter, for instance? Without utterly denying the possibility of this, I venture to assert that nowhere—in this country, at least, nor probably on the continent of Europe—is there such a quantity of nitrates, nitrites, or ammonia, produced from vegetable sources, as to appreciably affect the truth of my proposition, that the nitrogen in these forms, obtained by waters from terrestrial sources, is substantially due to the putrefaction and oxidation of sewage and manure matters.

It has been objected to this view of the origin and significance of these forms of combined nitrogen in waters, that waters derived from deep chalk wells contain them in large quantities; thus the Kent Company's water exhibits a previous sewage or manure contamination of from 3000 to 5000 parts in 100,000. But such objections disappear on examination; for instance, in the above case, it is well known that a very large proportion of the water collected in the London chalk basin consists of the drainage from manured land, and it is doubtless from this source that the large proportion of nitrates existing in this water is derived. According to Mr. Way's analyses, the drainage water from cultivated land contains an amount of nitrates corresponding to the following proportions of previous sewage contamination in 100,000 parts:—

	Max.	Min.	Mean.
Previous sewage contamination of drainage water from manured land	54,490	7,040	20,370
Ditto from pasture land (unmanured)	2,100	180	830

The results of the examination of various well waters, contained in the following table, further illustrate this point:—

Previous Sewage or Manure Contamination in 100,000 *Parts of various Well Waters.*

Names of Waters.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Previous Sewage Contam.
Artesian well at Grenelle	—	·006	0
Chalk well at Caterham	·009	·000	0
Water delivered by Kent Company	·001	·408	3,770
Water supplied to Worthing	·000	·426	3,940
Water delivered by South Essex Co.	·006	·848	8,205
Shallow well at Leyland, near Preston	·003	2·466	24,366
Shallow well at Ledbury	·001	1·575	15,440
Shallow well at Redhill	·002	1·446	14,160
Pump at Aldgate	—	—	38,080
" Minories	—	—	57,060
" Leadenhall Market	—	—	57,370
" St. Nicholas Olave Churchyard	—	—	75,640
Well in the Rue Taversine, Paris	—	—	299,780
Royal Institution well water	·001	4·355	43,240

With two remarkable exceptions the above results show the greatest previous sewage contamination precisely in those cases where it would be predicted; thus the shallow well water of Leyland, near Preston, consists almost entirely of the drainage from cesspools and market gardens, the latter being heavily manured with night-soil, farm-yard manure, and guano. It need, therefore, excite no surprise that nearly 25 per cent. of this water has been in a condition equivalent to average London sewage. The quality of the waters taken from the City pumps and from the well in the Royal Institution needs no comment; these shallow wells are now recognized as being fed by oxidized and somewhat diluted sewage. But in the well of the Rue Traversine, in Paris, this kind of contamination reaches, perhaps, its maximum. The cesspool system is still in full activity in Paris, and the soil of that city is saturated with liquid manure of such a strength that one gallon of it is equivalent to three gallons of average London sewage. As already mentioned, there are two remarkable exceptions in the above table to the general previous sewage contamination of well waters. These are the artesian well at Grenelle and the chalk well of the Caterham Water Company. With regard to the first, it is evident that the pressure of water which supports a column 122 feet above the surface at Grenelle precludes the possibility of admixture with the drainage of Paris; still there can be little doubt that the water supplying the chalk of the Paris basin is, to some extent, at least, contaminated by manure, although the land through which it drains is far less generally cultivated than that through which the water supply of the London chalk percolates.

The water from the Caterham Company's well comes, I believe, from a greater depth than that of the Kent and South Essex Companies; and this circumstance, coupled with the observation of Mr. Dugald Campbell, that the water of the deep chalk wells, unlike that of the shallower chalk wells, is free from nitrates, and taken in connexion with the fact that there is free water communication between the upper and lower chalk, points to the conclusion that chalk possesses the property of abstracting nitrates from water. If this be the case, it would also account for the circumstance that the water of the shallow chalk wells exhibits much less previous sewage contamination than might be expected. The average amount of nitrates found by Mr. Way in drainage water would indicate a previous sewage contamination in the chalk water equal to about 20,000 parts in 100,000, whilst the contamination actually exhibited, in the cases of the Kent, Worthing, and South Essex Companies, is only—Kent, 3770; Worthing, 3940; and South Essex, 8205, in 100,000 parts.

I have extended this investigation to various river and lake waters, as well as to spring waters, and have been here much indebted, as regards the non-British waters, to M. Boussingault's researches on the presence of nitrates in waters. The following tables exhibit the results of this investigation:—

Previous Sewage or Manure Contamination in 100,000 *Parts of various River and Lake Waters.*

Names of Waters.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Previous Sewage Contam.
Nile	—	·102	700
Rhine at Basle	—	·026	0
Seine at Notre Dame	—	·152	1200
Ourcq	—	·223	1910
Thames, as delivered in London	·005	·234	2062
Lea, do. do.	·002	·220	1901
Severn, near source	·003	·007	0
Lower Clywedog	·004	·006	0
Tarannon	·008	·024	0
Ceryst	·001	·052	210
Carno	·003	·049	190
Banw and Eira	·004	·023	0
Vyrnwy	·003	·011	0
Tylwch	·003	·004	0
Upper Rothay	·003	·002	0
Lowther	·002	·003	0
Kent	·001	·045	140
Sprint	·000	·021	0
Fourteen other Cumberland streams	—	—	0
Lake Waters.			
Bala Lake	·001	·000	0
Thirlmere	·003	·002	0
Haweswater	·004	·000	0
Ullswater	·003	·005	0
Watendlath Tarn	·002	·006	0
Loch Katrine	·002	·031	0
Five lakes and tarns examined by Boussingault	—	—	0

Previous Sewage or Manure Contamination in 100,000 *Parts of various Spring Waters.*

Names of Waters.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Previous Sewage Contam.
Mother Ludlaw's Cave	·001	·034	30
Water supply to Ferette, Haut Rhin	—	·039	70
Spring near Durmenach, Haut Rhin	—	·114	820
Source of the Roppensviller, Haut Rhin	—	·168	1,360
" " Arcueil	—	1·111	10,790
" " But at Montmartre	—	8·563	85,310
" " Martinet	—	·557	5,250
" " Trois Meules, St. Etienne	—	·210	1,780
Spring at Nismes	—	·129	970
Ebersbronn, Bas Rhin	—	·447	4,150
Water supplied to Woerth-sur-Säuer, Bas Rhin	—	·259	2,270
Source of the Ill, near Winckel, Haut Rhin	—	·104	720
Liebfrauenberg Spring, Bas Rhin	—	·005	0
Seltz, Bas Rhin	—	·008	0
Mineral spring of Bussang, Vosges	—	·003	0
Water supplied at Thann, Haut Rhin	—	·010	0
Source of the Boelacker, Haut Rhin	—	·018	0
Spring at Castle Fleckenstein, Bas Rhin	—	traces	0
Thermal spring at Baden	—	·016	0
" " at Dax	—	·013	0
Source of Presle, East Pyrenees	—	·013	0

The results embodied in the above tables throw considerable additional light upon this form of water contamination. They show, in the first place, that waters which have not been in suspicious company exhibit little, if any, previous sewage contamination; thus, in the whole of the Cumberland and Westmoreland district it only occurs in one instance (the Upper Kent, which, as every tourist knows, has a little cultivated land on its banks), and that to a small extent only. In the Welsh waters, again, there are only three instances. The spring water which issues from the greensand beneath an uncultivated but heather-covered surface at Mother Ludlaw's Cave, near Farnham, exhibits a mere trace of this contamination, whilst the waters of nine springs on the Rhine, in the Vosges, and in the Pyrenees, examined by M. Boussingault, exhibit no trace of previous sewage contamination. On the other hand, the spring forming the source of the But, and issuing not far from the cemetery at Montmartre, at once discloses its antecedents, and exhibits a previous sewage contamination of 85,310 parts in 100,000. It will be seen that the water of the Ourcq, which is now used only for watering the streets of Paris, exhibits a previous sewage contamination somewhat less than that of Thames water as consumed in London.

But what is the import of this previous sewage contamination? These skeleton compounds are innocuous; why trouble ourselves about them? True; they are innocuous, or nearly so; but, inasmuch as they show that the water has been in contact with animal refuse, they bring a heavy charge of suspicion against it. These refuse animal matters are known to contain that which is hurtful to human life. This hurtful matter is believed, on very strong evidence, to consist of spores or germs of organisms which are capable, under favourable circumstances, of producing in man such diseases as cholera, typhoid fever, and dysentery. Now, such spores or germs, endowed as they are with vitality, will be likely to resist the oxidizing agencies which convert the rest of the animal refuse into nitric acid, nitrous acid, and ammonia. For instance, if the contents of an egg were beaten up with water, and poured into the Thames at Oxford, the organic matter would probably be entirely oxidized and converted into mineral compounds before it reached Teddington; but, if the egg were thrown whole into the Thames at Oxford, it would, if it retained its vitality, be carried down to Teddington without any decomposition of its organic matter. There can be no doubt that the spores or germs of many organisms are in like manner capable of resisting for a long time the decomposing action of water. Now, no practicable process is known by which these spores, once introduced into water, can be again removed, or their vitality destroyed. Filtration will not do it; in fact, it is well known to engineers that water is often contaminated with visible suspended matter which cannot be separated by filtration. Thus, M. Belgrand says, "Lorsque l'eau est trouble dans le fleuve, elle sort louche de nos filtres;" and, speaking specially of the London water supply, "Le mode de dégrossissage employé par les grandes compagnies anglaises, *très convenable à Londres, où l'on ne boit pas d'eau, ne vaut rien à Paris, où les femmes, les enfants, les vieillards de la classe ouvrière n'ont pas d'autre boisson.* J'ai constaté par moi-même, et les ingénieurs anglais n'en disconviennent pas, que l'eau sort des filtres *très chargée de matière organique.*" Again, in the account of his remarkable researches on vaccine and small-pox poisons, recently communicated to the Academy of Sciences, M. Chauveau says, regarding the organic germs contained in these poisons, "Ils passent à travers tous les filtres."

Boiling even for several hours cannot be relied upon for the destruction of such germs, some of which have recently been shown to retain their vitality after four hours boiling; in fact, there can now no longer be any doubt that the cases of so-called spontaneous generation have all had their origin in ignorance of the excessive tenacity of life in the germs of the lowest organisms.

Nothing short of distillation, therefore, as it is carried on in nature, can be relied upon to free completely sewage contaminated water from its noxious constituents. Excessive filtration is, doubtless, to some extent a safeguard, and hence previous sewage contamination in chalk water, if we could be certain that the water had fairly filtered through some 100 feet of chalk, and that none of it gained access to the wells through fissures or swallow-holes, would have far less significance than it has in the case of a river water, where the fine suspended and noxious matters of sewage have but a comparatively slender chance of removal before the water reaches the consumer. We must, however, not forget that mere dilution fails, in the case of these suspended germs, to destroy their noxious quality, differing as they do, in this respect remarkably, from soluble poisons. The daily casting of a thousand fatal doses of strychnine into the Thames at Oxford ought not to occasion so much alarm amongst the London water drinkers as the present flow of the Oxford sewage into the river, because the excessive dilution of the soluble strychnine would effectually prevent its producing any physiological effect. Each living germ, on the other hand, contains within itself the power of indefinite multiplication and mischief. One such germ may be present in a wine-glassful of water, whereas it would be necessary to drink many thousands of gallons of water to imbibe a noxious amount of strychnine under the conditions just alluded to. I am, therefore, of opinion that water once contaminated with sewage or manure matter ought never again to be used for domestic purposes if any other supply can be obtained; and I endorse the advice of M. Belgrand, and the principle which guided him in the selection of his new water supply for Paris:—"On a dit des eaux potables, qu'elles étaient comme la femme de César, qu'elles ne devaient pas même être soupçonnées, et c'est mon avis."

A few words will suffice regarding the third class of mineral matters that may be present in the solid impurities of waters—viz., *poisonous substances, such as arsenic, copper, and lead.* These substances are only likely to occur in waters connected with mineral workings. One of them only (lead) has been detected in the proposed supplies, and that only in two streams in Cumberland, and in quantity far too minute to require any further notice.

The following table exhibits a comparative view of the amount and quality of the gas contained in the proposed and present water supplies:—

Gases Expelled in Boiling 100 *Volumes of various Waters.*

	Welsh Waters.			Cumberland Waters.			London Waters.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
Nitrogen	1·412	1·226	1·323	1·551	1·310	1·424	1·723	1·588	1·656
Oxygen	·642	·566	·612	·749	·667	·726	·832	.771	·801
Carbonic Acid	·335	·107	·227	·793	·085	·281	4·121	3·182	3·652
	2·389	1·899	2·162	3·093	2·062	2·431	6·676	5·541	6·109

You will find that the gases contained in the Welsh and Cumberland waters are very similar in quantity and proportion to those found in recently distilled water. Collected, as these waters are, near mountain ranges, which constitute the great condensers of natural distillation, this is exactly the result we should expect. The London waters differ mainly in containing more carbonic acid in solution, which makes them more sparkling in appearance. Sparkling waters are generally preferred by the public, although they commonly owe their briskness to extensive contact with decaying organic matter. It is thus that the highly sparkling pump waters of London are still preferred by many. On the other hand, soft waters are not necessarily vapid. No draught of water could be more delicious than that which is obtained from the public drinking fountains of Glasgow, supplied from Loch Katrine, although I find that 100 volumes of this water contain only the following gaseous constituents:—

Nitrogen	1·731 volumes.
Oxygen	·704 "
Carbonic acid	·113 "
	2·548 volumes.

The conditions which determine the action or non-action of water upon lead have hitherto been involved in much obscurity. Messrs. Graham, Miller, and Hofmann—the Government commission of 1851 on the supply of water to the metropolis—established the fact that the presence of dissolved oxygen and the absence of more than 3 volumes of carbonic acid in 100 volumes of water are amongst the conditions necessary for the attack of lead. The whole of the present water supply of the metropolis is perfectly protected from acting upon lead by the large quantity of carbonic acid which it contains. Still there are obviously other conditions involved in the problem, for all the samples of water from the Welsh and Cumberland districts contain, as shown in the above analytical results, dissolved oxygen, whilst not one of them possesses an amount of carbonic acid even remotely approaching that which is necessary to protect it; and yet some of these waters act violently upon lead, whilst others are entirely without action upon the metal. Having lately had occasion to observe that a sample of distilled water which acted powerfully upon lead completely lost this quality by momentary contact with animal charcoal, I found, on further investigation, that a minute quantity of the chief constituent of bone-black—viz., phosphate of lime—completely protects water from action upon lead. I then carefully examined for phosphate of lime the water of the river Kent (Upper Kent), which is eminently distinguished for its violent action upon lead, and the water of the river Vyrnwy, which, although nearly as soft as distilled water, has not the slightest action upon lead, even when placed in contact with a bright and freshly cut surface of the metal for 24 hours. This examination established the fact that the water of the Vyrnwy contained an appreciable amount of phosphate of lime, whilst not the slightest trace of this substance could be detected in that of the upper Kent. The waters from both the proposed districts have been carefully examined as regards their behaviour towards lead, and as the result of this examination it may be safely affirmed that no danger on this score need be apprehended from the introduction of water from either district into the metropolis. I here exhibit to you samples of lead in various waters, exemplifying the points upon which I have just spoken.

Lastly, I place before you in these large cylinders, holding more than a

gallon each, samples of the Welsh and Cumberland waters, side by side with a similar sample of Thames water, which fairly represents the condition of more than 3-5ths of this water as it has been delivered in London since the 21st of January last. But it may be asked, will these waters from Wales or Cumberland reach the metropolis in this colourless, transparent, and soft condition after passing through a conduit from 180 to 280 miles in length? Let me tell you what I conceive will be the effect of such a conduit upon the water. For the first two or three years a certain amount of lime from the surface of the cement in the conduit will dissolve in the water, communicating, at first, an amount of hardness probably not exceeding 5°; this effect will gradually subside, and after two or three years the water will be delivered in London in a slightly better condition than that in which it leaves the storeage reservoirs—a slightly better condition, because it will be better aërated than when it starts on its journey. At the present moment the water of Loch Katrine passes through a conduit 26 miles long, and I have lately carefully taken its hardness as it leaves the lake and as it is delivered to consumers in Glasgow. Its hardness on delivery in Glasgow is only 0·3°, exactly the same as in the lake, and its transit through 26 miles of conduit has, therefore, added no hardening constituent to the water. Now, if 26 miles of conduit fail to alter the hardness, I can only conclude that 180 or even 280 miles of conduit, if properly constructed, will also, after the lapse of a few years, be equally incompetent to produce any substantial increase in the hardness. At the time the above experiments were made Loch Katrine water had flowed through the conduit for seven years.

These are the principal points I have to bring before you in connexion with the proposed supply; and as a summary of the chemical investigation of the present water supply on the one hand, and of the samples furnished by the Welsh and Cumberland districts on the other, I may state the following conclusions to which these investigations have led me:—

1. The present water supply of the metropolis is largely contaminated with sewage. Both analysis and statistics concur in the statement that each glass of Thames water taken from the river by the companies contains one teaspoonful of sewage.

2. Although this sewage is always to a great extent oxidized before the delivery of the water in London, yet there is no guarantee whatever that all its noxious qualities are removed, because these noxious qualities are in all probability contained in the suspended and least oxidizable portion of the sewage.

3. The river water supplied in London is often very imperfectly filtered, and thus even the visible suspended matters of sewage are not wholly excluded from the water supply. Only on one occasion during the whole year 1867 have I obtained a transparent sample of water from the Southwark Company's mains. The Grand Junction Company's water was turbid four times out of twelve; the Chelsea thrice; the West Middlesex, Lambeth, and East London each twice out of the twelve occasions when the samples were drawn for analysis. The New River Company alone delivered perfectly filtered water during the whole year.

4. The quality of the water supplied to London is greatly inferior to that of any other town in the United Kingdom whose supply I have examined.

5. The distribution of water in the metropolis still continues, with but slight exceptions, on the intermittent system—a system which has been abolished in almost every other town of importance in the United Kingdom.

6. The water which it is proposed to supply either from the Welsh or the Cumberland districts is of excellent quality, equal or superior to that supplied to any town in Great Britain.

7. The water from each of the proposed districts is extremely soft, pleasant to drink, and of good aëration.

8. These waters have never been contaminated with sewage, and are therefore above all suspicion.

9. They could be distributed in the present system of supply-pipes without any danger of lead contamination.

The choice between the present and the proposed supply rests virtually with the inhabitants of the metropolis. Will you go to a source of pure water, uncontaminated with sewage, or will you continue the existing supply? I can anticipate your verdict, but you must not delay to record it. These splendid sources now available will not remain much longer within your reach.

DR. HILLIER'S REPORT ON THE GAS SUPPLIED BY THE IMPERIAL COMPANY TO THE VESTRY OF ST. PANCRAS DURING THE MONTH OF MARCH, 1868:—

Date.	Number of Observations.	Average Light in Candles produced by 5 Ft. of Gas per Hour.	Light in Candles reduced to Consumption of 120 Grs. per Hour.	Traces of Ammonia.	Traces of Sulphuretted Hydrogen.
Mar. 3	10	13·6	13·6	Yes.	No.
4	10	13·0	13·7	,,	,,
6	10	13·0	14·3	No.	,,
10	10	12·4	13·6	Yes.	,,
11	10	13·0	14·9	Slight.	,,
13	10	13·0	14·3	,,	,,
17	10	12·7	14·6	,,	,,
18	10	14·0	14·0	Yes.	,,
20	10	14·2	14·9	,,	,,
23	10	13·2	14·5	,,	,,
24	10	12·2	13·4	,,	,,
27	10	13·8	13·8	,,	,,
30	10	12·6	13·9	,,	,,
31	10	12·2	12·8	,,	,,

The illuminating power of the gas averaged 14·2 candles, ranging from 12·8 to 14·9 at the times of my examinations. Ammonia has been rather less constantly present. Sulphuretted hydrogen has been absent as usual; but sulphur has on two occasions when this was measured exceeded 20 grains in the 100 cubic feet, once being 26·8 grains, and once 23·5. There has been considerably more sulphur in the gas than usual; and this is an impurity which is very objectionable, and can be avoided, as the state of the gas in former months proves.

FRAUDS UPON GAS COMPANIES.—At the Worship Street Police Court, on the 14th inst., John Henry Hewitt Stokes, an elderly man, living at 5, Church Road, De Beauvoir Town, Kingsland, was charged on remand with having obtained, by means of false representations, various sums of money from several persons, thereby defrauding among others the Imperial Gaslight and Coke Company. The prisoner was first brought up on a charge of stealing a purse and five sovereigns, the property of Miss Dakin, he having gone to that lady's house and solicited her signature to a petition for cheap gas, and, whilst in the parlour waiting for her to sign, he took the purse, which contained the sum mentioned, from the mantelshelf. On that charge the prisoner had been already committed for trial, but Serjeant Gould stating that there were several charges against the prisoner, in which he believed prosecutions would be instituted, of obtaining money by representing himself to be a gas-rate collector's assistant, the prisoner was remanded. Mr. Willoughby now appeared to prosecute the prisoner, on behalf of the Imperial Gaslight and Coke Company. Mr. Alfred Frost, of 284, Kingsland Road, said the prisoner called on him on the 14th of March last, and represented himself to be the assistant to Mr. Lefevre, gas-rate collector for the district, and witness, on the strength of that representation, paid the prisoner £1 5s., and he receipted a paper for the same. Mr. Henry Lefevre, the district collector in the service of the Imperial Gaslight Company, stated that the prisoner had never been employed by him, or authorized to collect gas accounts by him from customers. Mary Ann Marston, servant to Mrs. Olive Turner, of 16, Hackney Terrace, recognized the prisoner as the person who had called at her mistress's house, on the 21st of October, and asked to look at the gas-meter, and was then paid by her mistress 9s. for the gas account, and he attached a signature to the printed bill they gave him. Mr. John Walker, chief ledger clerk in the employment of the Chartered Gas Company, proved that the prisoner was never in their employ, or authorized to collect money from customers on their behalf. Mr. Richard Morgan, of 107, Halton Road, Cambridge Square, deposed to having, on the 2nd of November last, paid the prisoner 8s. for gas supplied, he representing himself to be the collector's assistant for the district. Mr. Willoughby stated that he could prove several other cases against the prisoner; but the magistrate said there was no necessity to go further with the matter; quite sufficient evidence had been given to send him to the higher court, and the prisoner was committed to the sessions on all the charges.

THE HYTHE GAS COMPANY'S BILL.—The opposition of the Folkestone Gas Company to the Hythe and Sandgate Gas Company has been withdrawn, upon the latter company consenting to expunge from their bill the clauses by which they sought to obtain power to supply Shorncliffe Camp with gas.

SALE OF CHATHAM AND ROCHESTER WATER-WORK SHARES.—At a sale by auction of shares in the Chatham and Rochester Water-Works Company, by Mr. J. Thomas, a few days ago, the price realized for the £5 shares was £7 1s., the competition being very keen.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE WATER SUPPLIED IN ST. MARYLEBONE, IN MARCH, 1868:—

March.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	Mar., 1867. 0°	Mar., 1868. 0°	Mar., 1867. 0°	Mar., 1868. 0°	0°
Distilled Water . . .					
West Middlesex water	19·60	19·04	1·16	0·68	—
Grand Junction water	18·16	19·64	1·28	0·80	—

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

The water supplied to the parish during the past month by the Thames water companies has been characterized by a degree of clearness, brightness, and purity somewhat unusual at this period of the year, and speaks very highly for the care bestowed upon the process of filtration, and the efficiency of the means adopted. By reference to the above table it will be seen that the loss by incineration—which approximately represents the amount of organic matter contained in the water—was considerably less in the month just ended than in the same month of 1867. The saline matter, which gives to the water its hardening properties, remains about the same; this, however, in no degree takes from its excellence or value as a potable water, but, on the contrary, in my opinion, rather enhances it, whilst, as compared with pure or soft water, it is infinitely more palatable.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE GAS SUPPLIED IN ST. MARYLEBONE, IN MARCH, 1868:—

March.	Illuminating Power in Sperm Candles.			Mean Pressure in 10ths of an inch.		Mean Amount of Sulphur in 100 Cub. Ft.
	*Mean of 27 Observations.	Highest.	Lowest.	Highest.	Lowest.	
Imperial Co.'s gas . .	15·50	16·28	14·02	21·25	9·76	20·16
Chartered Co.'s common gas	13·31	14·12	12·53	39·28	14·17	24·09
Chartered Co.'s cannel gas	20·99	22·02	20·06	32·51	12·52	21·10

* Each observation consists of 10 readings of the photometer.

The mean illuminating power of the Imperial Company's gas during March was equal to 15½ sperm candles or 29 per cent. above the standard, five times it exceeded 16 candles, and twice did it fall below 14 candles. As regards its quality, I have to remark that on 15 days during the month the ordinary test paper showed an excess of ammonia, that is to say, a greater quantity of that impurity than is usually detected. The mean of three analyses gave a very slight excess of sulphur, but no sulphuretted hydrogen was found. Its pressure was satisfactory. The mean light of the common gas of the Chartered Company was equal to 13¼ sperm candles, or above 11 per cent. in excess of the standard, twice it was over 14 candles, and on no occasion did it fall below the standard. The mean of three careful analyses showed an excess of sulphur to the extent of 4 grains in each 100 cubic feet of gas beyond what the law allows; on 17 days during the month ammonia in excess was detected, but no sulphuretted hydrogen was ever found. Its pressure was always very good. The cannel gas of the same company gave a mean light of one candle above the standard, on one occasion it reached 22 candles. In this gas also rather more than the usual traces of ammonia were shown on the test paper, whilst the mean of three analyses for sulphur showed that this impurity was to a trifling amount in excess of what is permitted by law. Its pressure was good. The above results were obtained from the gas manufactured by the Imperial Company, at their Fulham works, and from the common and cannel gas of the Chartered Company, at their works in the Horseferry Road, Westminster.

THE LONDON & WESTMINSTER METER COMPANY, LIMITED.

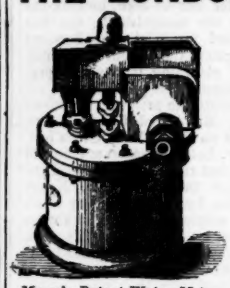
PATENTEES AND SOLE MANUFACTURERS OF

THE ABC GAS-METER.

EDGE'S PATENT INDEX.

MYERS'S PATENT WATER-METER.

(A CYLINDER and PISTON.)



Myers's Patent Water-Meter.

The ABC GAS-METER shows in plain figures the money payable for Gas consumed, at well as the number of cubic feet.

A B C Gas-Meter.

MYERS'S WATER-METER is accurate in measurement, simple in action, and moderate in price.

Manufacturers of the ordinary Wet and Dry Meters, Governors, Photometers, and all other Gas and Water Apparatus.

JOHNSON'S PLACE, LUPUS STREET, LONDON, S.W.

CITY OFFICE: 2, CASTLE COURT, BIRCHIN LANE, E.C.

JOHN VICKARY,

GAS ENGINEER AND CONTRACTOR, IRON AND BRASS FOUNDER,

WORKS—EXE ISLAND, EXETER,

Tenders his best thanks to the various Gas Companies in **England, Ireland, and Wales,** for the very liberal and kind support he has received for the last **22 years,** during which period he has erected and extended above **200 Gas-Works.**

In addition to the numerous towns wherein he has been engaged, he begs reference to the following testimonial:—

Plymouth and Stonehouse Gaslight and Coke Company.

Sir,—I have much pleasure in testifying that the 100-foot Telescope Gasholder and Cast-Iron Tank, erected by you for this Company in 1862, has given the highest satisfaction, and never required the slightest attention or adjustment since its completion.

(Signed) PETER ADAMS, Chairman.

He has also erected a 100-foot Gasholder and Cast-Iron Tank at **Exeter;** an 80-foot Telescope Gasholder and Iron Tank at **Devonport;** a 90-foot at **Torquay,** &c. &c. At either of those works satisfactory references can be made.

He also begs particular attention to his **Improved Gas-Meters,** either **Wet, Dry, or Compensating,** the materials and workmanship of which guaranteed of the very best description, and which has gained for his Meters so excellent a reputation for these last **20 years.**

RETORTS, DIP & ASCENSION PIPES, HYDRAULIC MAIN, CONDENSERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, and GASHOLDERS,

Of any size, and every description of article required in Gas-Works.

Mains, Tees, Connexions, and Syphons, from 2 to 12 in., always in stock, and supplied at Scotch prices.

Clay Retorts and Fire-Goods of every description.

Gas-Fittings of the most modern designs.

Iron Pipe and Fittings, Service Cocks, &c.

Plans, Specifications, and Estimate for the erection of New Gas-Works of any size furnished.

TO CORPORATIONS, GAS ENGINEERS, AND OTHERS.

HENRY ALDER,

GRANGE METER-WORKS, EDINBURGH,

Begs to intimate that he is the ORIGINAL MANUFACTURER of

DRY GAS-METERS IN CAST-IRON CASES.

The Meters are protected by Registration on the 17th of December, 1864, under the "Copyright of Designs Act."

They are much more durable, and at the same time more easily repaired than those in Tin Cases.

PRICE LIST AND TERMS ON APPLICATION.

Agent for Ireland—Mr. J. FURNESS, 3, Fownes Street, DUBLIN.

HENRY ALDER begs to call attention to the following statement:—"In a conversation, held in 1864, with the late "Mr. Adamson, the able Engineer of the Leeds New Gas Company, he pointed out to me the practicability of having "DRY METERS in CAST-IRON CASES. On my return home I worked out the suggestion, and REGISTERED a "METER of this construction on the 17th of December, 1864. Previously to the 31st of March, 1865, I had supplied "Meters in Cast-Iron Cases to Gas-Works in Airdrie, Blackburn, Brighouse, Chorley, Glasgow, Heywood, Huddersfield, "Leeds, Newcastle, North Shields, Rochdale, Rotterdam, Salford, Sunderland, &c. I need hardly inform you, in view of "these facts, that the following Advertisement, to which my attention has just been called, was read by me with feelings of "much astonishment:—'THE ONLY COMPLETE CAST-IRON CASED DRY GAS-METER.—Patented March 31, "1865.—Gas Engineers and others will find that the above Meter is made of the most durable material, also that it can be "repaired at a fraction of the cost of *any other Meter* now manufactured, all the interior fittings, as well as the case, being "fitted together with screws. Drawings explanatory of the above on application. Sole Manufacturers: FULLERTON, "SON, & Co.' I shall not characterize this. It would, however, be esteemed a great favour were you, when opportunity "occurs, to compare the Dry Meter in Cast-Iron Case, registered by me in 1864, with that named in the Advertisement. "You will then be able to determine whether the latter be only an imperfect copy of mine."

GAS ENGINEER wanted, to proceed to China to MANAGE a Gas Apparatus, lay pipes, &c.

Apply by letter only, with references and testimonials, to H. C. B., 155, CANNON STREET, E.C.

TO GAS COMPANIES.

A Manager of 15 years experience is desirous of a re-engagement in a similar capacity, or as Manager and Secretary.

Address X., Messrs. Marlborough and Co., Ave Maria Lane, LONDON.

WANTED, by the Advertiser, who has had 12 years experience in the erection and management of gas-works, an appointment as MANAGER, or to erect works at home or abroad. Has a thorough knowledge of the Spanish language. First-class references.

Address "FABRICANTE," Post-Office, SLIGO.

WANTED, by the Advertiser, a situation as Manager, Secretary, and Collector, or any single branch, in a gas-work. Twelve years experience in the carbonization and distribution of gas, main and service laying, gas-fitting in all its branches, and book-keeping by double or single entry.

Address D. M., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Northampton Gas-light Company, a MAN thoroughly competent to take charge of the fitting and street-main department. He must be a practical fitter, and competent to take charge of the books in his department. Salary £100 per annum.

Application to be made to Mr. JOHN EUNSON, jun., engineer to the company, on or before Monday, May 18.

Northampton, April 22, 1868.

BOROUGH OF SALFORD.

WANTED, in the Corporation Gas-Works, Lamb Lane, Salford, a CHIEF CLERK, thoroughly conversant with book-keeping, and possessing a knowledge of the manufacture of gas, and whose age is not under 28 years.

Salary after the rate of £150 per annum. Security required to the extent of £300.

Applications, with testimonials of recent date, to be delivered at the Gas-Works, Lamb Lane, addressed to the Chairman of the Gas Committee, and endorsed, "Application for Chief Clerk," on or before Saturday, May 2, 1868. By order,

GEO. BRETT, Town-Clerk.

April 22, 1868.

TO PROVINCIAL GAS COMPANIES & OTHERS.

WANTED, by the Advertiser, a situation as MANAGER of a gas-work. Has had several years experience in the setting and working of clay and iron retorts, the laying of mains and services; also the erection of gas-fittings, and the general working of both steam-engine and exhauster in connexion with clay retorts. Advertiser is 35 years of age, and has no objection to go abroad.

Address W. E., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-WORKS.

WANTED, an active Working MANAGER of experience, who is competent to take the entire charge of moderate-sized works, and who would exert himself to increase the business of a thriving company, which is capable of great extension. Wages about 25s. per week, with house, firing, and gas free.

Apply to the SECRETARY, Gas-Works, Sutton Coldfield, near BIRMINGHAM.

CRYSTAL PALACE DISTRICT GAS COMPANY.

WANTED, Tenders at per Ton for UNLOADING COAL from Railway Trucks in the Company's Works into the Coal Stores. Quantity about 20,000 tons per annum.

Full particulars can be obtained by application to the Engineer and Manager, Mr. E. S. Cathels, at the Works. Letters to be addressed to the Chairman, and sent in by Thursday, the 30th inst.

By order of the Board,
MAGNUS OHREN, Secretary.

Offices at the Works, Lower Sydenham, S.E.,
April 17, 1868.

WANTED, to Purchase a Second-Hand Cast-Iron TANK, about 30 ft. diameter by 12 or 14 ft. deep.

Apply to ALFRED H. WOOD, Gas Engineer, HASTINGS.

COAL TAR.

TO BE LET, immediately, for One, Two, or Three years, the TAR produced at the Works of the Sunderland Gas Company. Quantity about 200,000 gallons per annum.

The principal manufacturing station of the Company has a siding on to the North-Eastern Railway, and is a short distance from the South Dock.

The Directors will receive tenders until May 4.

JOHN H. COX, Secretary.

THE Directors of the Robertsbridge Gaslight and Coke Company, Limited, are desirous of receiving TENDERS for the erection of the PLANT of their Works (Gasholder, 30 ft. by 10 ft.; Purifiers, &c.).

The plans and specification may now be seen by application to me, and sealed tenders must be delivered on or before Tuesday, the 11th of May next.

ALFRED H. WOOD, Gas Manager.

Hastings, April 20, 1868.

BRITISH ASSOCIATION OF GAS MANAGERS.

PRELIMINARY NOTICE.

The FIFTH ANNUAL MEETING of MEMBERS will be held at the Rooms of the Society of Arts, John Street, Adelphi, London, on JUNE 2, 1868, and following days.

The Chair to be taken by THOS. G. BARLOW, Esq., President of the Association.

JAMES BLACKBURN, Hon. Sec.

Gas-Works, Droylsden, near Manchester,
April 24, 1868.

BAHIA GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY HALF-YEARLY MEETING of this Company will be held at the London Tavern, Bishopsgate Street, E.C., on THURSDAY, the 30th day of April, 1868, to receive the Report of the Directors, the Balance-Sheet approved by the Auditors, and for general purposes.

The chair will be taken at Two o'clock precisely.

By order of the Board,
April 8, 1868. ARTHUR CLARKE, Secretary.

GASHOLDER FOR SALE.

ONE, 40 ft. diameter and 16 ft. deep; Four, 40 ft. diameter and 13 ft. deep; One, 28 ft. diameter and 8 ft. deep. All quite new.

For particulars apply to THOS. PIGGOTT & SON, Swallow Foundry, Spring Hill, BIRMINGHAM.

FOR SALE, a cast-iron Gas-Tank, 31 ft. diameter by 12½ ft. deep, in good condition. Also two 11 ft. lengths of HYDRAULIC MAINS, 11 in. diameter, with 9 flanged connexions for dip-pipes.

For price and particulars apply to the SECRETARY of the Gas Company, BRIDLINGTON QUAY.

TO GAS-WORKS CONTRACTORS.

THE Directors of the Newark Gas Company are desirous of receiving TENDERS for the erection of—

1. A GASHOLDER, to contain 60,000 cubic feet, with columns, girders, &c., complete.
2. Also a BRICK TANK for the above.
3. Also a RETORT-HOUSE, with chimney, &c., complete, to contain the retorts as under.
4. Also 7 beds of CLAY THROUGH-RETORTS, 5 in each bed.

Tenders, with specifications and plans accompanying same, for any or the whole of the above work separately, according to the number, to be sent in to the Secretary's Office, Newark, on or before the 14th day of May next, and must be approved of by the Company's Engineer.

The Directors do not pledge themselves to accept the lowest or any tender.

Any further information may be obtained at the Secretary's Office. By order,

C. C. FOOTTIT, Secretary.

Newark, April 25, 1868.

WEARDALE & SHILDON DISTRICT WATER-WORKS COMPANY.

TO CONTRACTORS FOR RESERVOIRS, &c.

THE Directors of the Weardale and Shildon District Water-Works Company are prepared to receive TENDERS for the construction of a large STORAGE RESERVOIR, two lines of Catch-water, and other Works, on Waskerley Moor, in the County of Durham. These Works are situated within half a mile of the Stockton and Darlington Railway.

Drawings and specifications may be inspected, and printed forms of tender may be obtained, at the Offices of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., and W. Bouch, Esq., North Road, Darlington, on and after Monday, the 4th day of May, and tenders must be delivered at my Office on or before Monday, the 18th day of May.

The Directors do not pledge themselves to accept the lowest or any tender.

By order,
WILLIAM HARDING, Secretary.

Russell Street Buildings, Darlington.
April 20, 1868.

The earth-work may amount to 400,000 cubic yards or more.

Schedules of quantities will be supplied to Contractors at a charge of £2 2s. each copy.

TO TAR DISTILLERS.

THE Bedford Gaslight Company are prepared to receive TENDERS for the purchase of their surplus TAR for One, Two, or Three years. Quantity per annum about 20,000 gallons.

Tenders addressed to the MANAGER, Gas-Works, Bedford, BEDS.

STATION-METER.

THE Directors of the Ashton-under-Lyne Gas Company are prepared to receive TENDERS for the purchase of a STATION-METER, which is being replaced by a larger one. The Meter is in an ornamental case, 9 ft. 6 in. by 8 ft. 6 in., with 10-in. connexions, hydraulic valve, by-pass, &c., and two 10-in. water-valves, capable of passing 20,000 feet per hour, made by West, of Oldham. One of the plates will be removed so that the interior of the Meter can be seen. The Company will take down the Meter, the purchaser to remove it at his own cost.

Tenders to state the price in one sum, addressed to the undersigned, and delivered on Friday, the 15th of May, endorsed "Tender for Purchase of Station-Meter."

The Directors do not bind themselves to accept the highest or any tender.

ISAAC KELSALL, Manager.

Gas Offices, Oldham Road, Ashton-under-Lyne,
April 24, 1868.

PATENT Gas-Producing Mixture.—

It having come to the subscriber's knowledge that some individuals in Britain have exported to Paris and other continental towns quantities of a Gas-Producing Mixture, known in Britain as "M'Kenzie's or Hamilton's Patent," the subscriber, Mr. B. Hugo Dullens, who holds patents for this invention for France, Belgium, Holland, Italy, Austria, Denmark, and other continental countries, as well as the United States, hereby WARNS all parties against exporting any of said patented material, certifying those who shall do so, that not only will the material be confiscated, but he will proceed against them for such penalties and damages as the law may award to him.

B. HUGO DULLENS, Bieberich, Nassau.
JAMES Y. PULLAR, L.S.C.,
17, Broughton Place, Edinburgh,
Agent for Mr. Dullens.

THE LEWES GASLIGHT COMPANY.

THE Directors of this Company will be prepared to receive TENDERS at the time hereafter mentioned for the necessary excavations and the construction of a Cast-Iron GASHOLDER-TANK, 92 ft. by 24 ft.

Plans and specification may be seen, and other information obtained, on and after the 20th inst., by application, at the Works, to Mr. Wright, Manager.

Sealed tenders, marked "Tender for Tank," are requested to be delivered on or before the 6th day of May next, addressed, under cover for the Directors, to the undersigned.

The Directors do not bind themselves to accept the owest or any other tender.

EDWARD HILLMAN, Clerk to the Company.

Lewes, April 9, 1868.

TO COAL MERCHANTS & SHIPOWNERS.

THE Torquay Gas Company are desirous of receiving, on or before the 7th day of May next, TENDERS for the supply of about 4000 tons of Waldridge, Pelton, North Pelton, New Pelton, Pelaw Main, Peareth, or other approved COAL; about 600 tons per month to be delivered during June, July, August, and September; and the remainder, at the rate of about 300 tons per month, during the five succeeding months.

The Company to have the option from time to time of taking either of the Coals above specified, and also of the same being delivered at Torquay, Paignton, or Dartmouth.

Payments by cash for freight on delivery, and by two months bill for the Coal.

Tenders to state the price of the Coals and the freight separately and together, and also for delivery into the works free of all charges.

By order,
J. KITSON, Secretary.

Torquay, April 22, 1868.

THE Directors of the Southampton Gaslight and Coke Company are desirous of SELLING the following apparatus:—A set of Four PURIFIERS, 10 ft. square, with centre hydraulic valve, covers, and sieves; an Annular CONDENSER of four columns and chambers, with 12-in. connexions; about 120 ft. run of Cast-Iron HYDRAULIC MAIN, D-shape, 14 in. by 12 in., with 75 complete sets of ascension-pipes and mouthpieces.

Full particulars may be obtained of Mr. DURKIN, Manager, Gas-Works, SOUTHAMPTON.

POPE & PEARSON'S Gas Coal.—

We beg to call the attention of all Gas Companies to this important winning, at a depth of 1275 feet. The yield of gas is more than 10,000 cubic feet per ton, with an illuminating power of 20 spermaceti candles, producing 12¼ cwt. of coke per ton. The Coals are now being used by the Gas Companies in London. One Engineer, after trial, gives the following results:—

10,000	cubic feet per ton, and	19·13	candles.
11,468	,, ,,	16·57	,,
12,000	,, ,,	15·42	,,
13,260	,, ,,	15·00	,,

This valuable Coal can be delivered in London within 1s. per ton of the ordinary Newcastle Gas Coal; can be shipped at the ports of Hull and Goole, or by railway to any station.

For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near Leeds, YORKSHIRE.

FRASER'S PATENT RIBBED RETORTS.

These Retorts are now used at more than 60 Gas-Works, and continue to give satisfaction.

The Iron Retort is recommended for great durability. The Clay Ovens and Retorts obtain a more speedy and perfect carbonization of the Coal.

To ensure the excellence of the Brick Ovens and Fire-Clay Retorts, the Patentee has made arrangements with the following makers for their supply:—

Messrs. J. CLIFF & SON, Wortley, near Leeds.
E. BAKER & CO., Stourbridge.
W. COCHRANE CARR, Newcastle-on-Tyne.
W. FRASER, Inverkeithing, N.B.

Full particulars, with illustrated circular, testimonials, and prices, will be forwarded on application to A. C. FRASER, Gas-Works, COLCHESTER.

Mr. H. GORE,

CONSULTING GAS ENGINEER,

20, ALFRED PLACE, BEDFORD SQUARE, LONDON, W.C.

Plans and Specifications prepared for the Erection of NEW or ALTERATION and IMPROVEMENT of EXISTING WORKS. Valuations made.

DESIGNS FOR WORKS & MACHINERY *specially adapted for India, China, & South America.*

Drawings and Specifications for improved RETORT SETTINGS.

GAS AND WATER PIPES.

CLARIDGE, NORTH, & CO.,

BILSTON.

EDWARD COCKEY & SONS,

IRON-WORKS, FROME SELWOOD,

PATENT GAS-VALVES.

A PRIZE MEDAL

WAS AWARDED TO THE PATENTEES AT THE INTERNATIONAL EXHIBITION OF 1862.

These Valves are formed of two cylinders, working one on the other horizontally, having their faces ground perfectly gas-tight.

They are adapted either as central valves, for two, three, or four purifiers—as bye-passes—or as inlet and outlet-valves for gasholders.

They have been fixed in some of the most important Gas-Works in the Kingdom, for more than eight years. Considerably over two hundred of them are now in use, and the most satisfactory reports of their advantages continue to be received. They are simple in construction, and not liable to get out of repair, and if in course of time the faces should leak, they can be easily re-ground and made as tight as ever, without removal from their positions. Each Valve is fitted with an index, which shows to the person in charge of the Works in what direction the gas is passing.

Frome, January 20, 1866.

LIVESEY FIRE-CLAY WORKS,

NEAR BLACKBURN, LANCASHIRE.

ORLANDO BROTHERS,

MANUFACTURER OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

B. CARPENTER'S

IMPROVED

WOOD SIEVES FOR GAS PURIFIERS.

WORKS:

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LONDON, N.

The above Sieves are used by the principal Gas Companies in London and the country. Their utility, durability, and cheapness combined, render them superior to all others.

Testimonials from Gas Engineers who have tested their qualities forwarded on application.

All orders punctually attended to, and estimates given if required.

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BRITISH IRON TUBE COMPANY,

MANUFACTURERS OF

PATENT WELDED WROUGHT-IRON TUBES & FITTINGS,

For Gas, Steam, and Water;

SCREWING TACKLE, CORE BARS,

Hydraulic and other Tubes and Coils, to order.

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D. W. OGG and CO. have lately engaged to represent one of the largest shippers of Scotch Cannels at prices that cannot fail to command the attention of Gas Companies at a period like the present, when quality of gas seems so desirable.

Offices, 3, Jeffrey's Square, St. Mary Axe, LONDON.

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Gas Engineer and Contractor, Rose Mount Foundry, Elland, near Halifax.

R. D. recommends his Fire-Brick Retorts to Engineers and Managers of Gas Companies; they last from 10 to 12 years.

Iron and Fire-Clay Retorts.
Annular and Pipe Condensers.
Scrubbers and Purifiers, all sizes.
Steam-Engines and Exhausters.
Hydraulic Centre-Valves.
Station-Meters and Governors.
Photometers & Pressure-Gauges.
Lamp-posts and Brackets.
Cast-Iron Mains and Syphons.
Wrought-Iron Tubes, Water Tanks.
Wrought-Iron & Cast-Iron Roofs.
Gasholders, Single-Lift or Telescopic.
Gas Castings of every description.
Retort Setters and Fitters sent to all parts of the country.
Wood Sieves for Purifiers.

Plans and Specifications prepared.

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BRASS & IRON FOUNDERS,

Manufacturers of

BRASS GAS-FITTINGS, CHANDELIERS, &c.,

In various styles; also of

PATENT WELDED WROUGHT-IRON TUBES AND FITTINGS.

Catalogues and prices on application at the WORKS AND SHOW-ROOMS,

NEW CHURCH STREET, SUMMER LANE, BIRMINGHAM.

OXIDE OF IRON,

We are prepared to supply, on moderate terms,

HYDRATED PEROXIDE OF IRON (BOG OCHRE),

Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.

FRANCIS RITCHIE & SONS,

BELFAST.

LAMP-POSTS—Plain & Ornamental.
DWARF GAS-PILLARS—Do., do.
LAMP-BRACKETS—Do., do.
LAMPS, in Copper, Tin, and Iron—Do., do.
NUMBERS for STREET-LAMPS.
FOUNTAINS—Garden and Drinking.
VASES—for Gardens, Terraces, &c.

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HYDRATED OXIDE of IRON

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THE LIQUID METER COMPANY,
LIMITED.

A. A. CROLL, Chairman. GEORGE RAIT, Managing Director.

238, KINGSLAND ROAD, LONDON, N.E.

GEORGE ANDERSON,
GAS AND CONSULTING ENGINEER,
19, NORTHUMBERLAND STREET, STRAND, W.C.

Mr. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.
STEAM-ENGINES and EXHAUSTERS, separately or combined.
FOUR-WAY VALVES, one of which is equal to three ordinary Valves.
STATION GOVERNORS—the Gasholder cannot tilt and cause accident.
BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan*.

TO MANAGERS OF GAS-WORKS.

MANN'S IMPROVED SCRUBBER.

See Description and Sketch in "JOURNAL OF GAS LIGHTING," March 31, 1868.

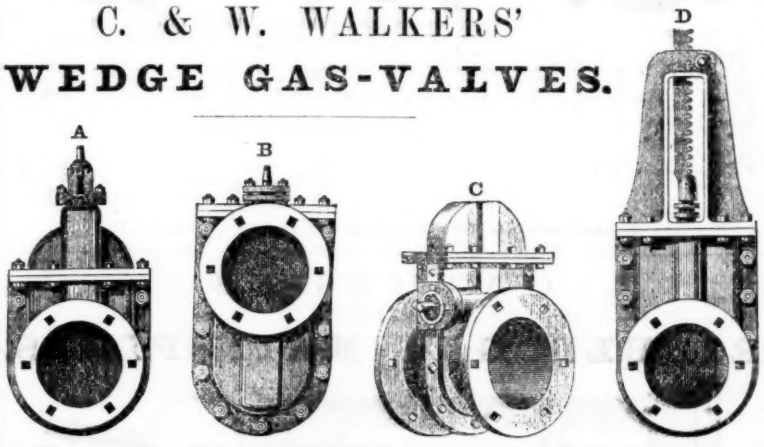
Messrs. WESTWOOD & WRIGHTS are prepared to submit estimates for the supply and erection complete of the above, either in London or the Provinces.

Messrs. W. & W. have already constructed several, which are now in successful operation, and give great satisfaction.

In cases where Scrubbers are already constructed, estimates will be submitted for altering and adapting to this principle.

Messrs. WESTWOOD and WRIGHTS,
No. 4, WHARF, CANAL ROAD, KINGSLAND ROAD, LONDON, N.
HOPE BOILER & GASOMETER WORKS,
BRIERLEY HILL, STAFFORDSHIRE, NEAR DUDLEY.

C. & W. WALKERS'
WEDGE GAS-VALVES.



These justly celebrated and well-known Gas-Valves of the most perfect workmanship and construction are made at as low a price as any other kind.

A—Above-ground Screw Gas-Valve, with improved indicator to show when open and shut, is the best kind of Valve for heavy pressures, such as the oxide of iron purification.
B—Under-ground Screw Gas-Valve.
C—Internal Rack Gas-Valve, with wrought-iron pinions.
D—Ordinary Rack and Pinion Valve, with strong undamageable racks and pinions.

MIDLAND IRON-WORKS,
DONNINGTON, NEWPORT, SHROPSHIRE.

PURIFICATION OF GAS.

FRODINGHAM IRONSTONE MINES,
NEAR
BRIGG, LINCOLNSHIRE.

Gas Companies can be supplied from these Mines with OXIDE of IRON, for the purification of Gas, on reasonable terms, and in any quantity that may be required.

This material is a natural Oxide, and is supplied to Gas Companies as taken from the Mines, without any admixture of deleterious matter. It acts freely, and will purify a much larger quantity of gas per ton, than the generality of the material now in use under this name.

It will be found highly beneficial in large establishments, where they are liable to be called upon occasionally to make a much greater quantity of gas than usual, as well as in small establishments where they are limited in space, as by its adoption a much larger quantity of gas can in much less time be purified with the same quantity of material.

Apply to Mr. James Sherwood, at the Mines; or to Mr. Livesey, 6, Victoria Street, Westminster, London Agent.

NO NECESSITY
FOR
CANNEL COAL
If POPE and PEARSON'S GAS COAL is used.

West Riding and Silkstone Collieries,
near Leeds.

NINETEEN YEARS PRACTICAL EXPERIENCE.

EDWIN BENTLEY,
RETORT SETTER,
29, LOWER HOPE STREET, HALIFAX,
YORKSHIRE.

Fire-Clay and Iron Retorts, Double and Single Grooved Brick Retorts, of every description.
Bentley's Improved D Brick Segment Retorts, 5 or 3 in one bed.
Testimonials and references on application.

THOMAS LAMBERT & SON,
SHORT STREET, LAMBETH, LONDON.

CARTER'S SAFETY GAS-VALVES,
Made to suit every Description of Fittings.
Section of Valve open.

Manufacturers of
WROUGHT-IRON PIPES AND FITTINGS,
SLUICE-VALVES & STOP-COCKS,
STOCKS, TAPS, AND DIES,
CHANDELIERS, PENDANTS, &c.
PATENT MERCURIAL GAS-REGULATORS.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Office in London, Mr. E. M. Perkins, 78, Lombard Street.

ROBERT MACLAREN and CO.,
EGLINTON FOUNDRY, GLASGOW,
Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

CATHELS'S Patent Four-way Disc GAS-VALVE, now in general use, is the best Valve for Purifiers, Scrubbers, Station-Meters, and other apparatus in Gas-Works, ONE VALVE SERVING AS THREE ORDINARY VALVES, with a simplification of the connecting-pipes. It is simple, strong, and durable; has no springs, ground faces, or rubbing surfaces; is easily worked, and indicates at a glance the passage of the gas.

CATHELS'S Patent District Dry Gas GOVERNOR is the only perfect self-acting contrivance for regulating the pressures in the higher levels of a district. It enables such pressures to be reduced to any extent desired, and yet be INCREASED AND DIMINISHED, AS WANTED, PROPORTIONATELY WITH THE INITIAL PRESSURE. It is simple, certain in its action, and of moderate cost.

For descriptive circulars, prices, and testimonials, of the Valve and Governor, apply to the Manufacturers, Messrs. Guest and Chrimes, Rotherham.

Now ready, price 21s., bound in cloth, lettered,

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With an Analysis of the Report presented by the Committee to the House.

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And Description of a New Apparatus for its Estimation.
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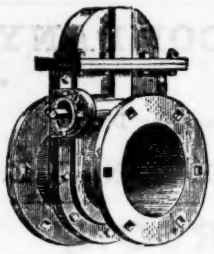

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B. DONKIN & CO.'S
IMPROVED GAS VALVES
WITH WROUGHT-IRON PINIONS
from 2 inches to 18 inches, price 9s. 6d. to 12s. per inch diameter
List of prices, with full dimensions of all sizes up to 36 inches, to be had on application.
These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.
Valves made with Outside Racks to order. Also, Screw Water-Valves with Gun-Metal Faces.
B. DONKIN & CO.,
ENGINEERS,
NEAR GRANGE ROAD, BERMONDSEY.

F. & C. OSLER,
45, OXFORD STREET, LONDON;
Manufactory—Broad Street, Birmingham—Established 1807,
MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.
ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards
(Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.
THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

WALTER FORD,
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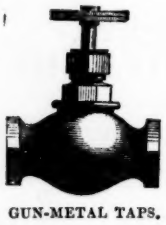
MANUFACTURER OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, &c. &c.

Sole Manufacturer of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

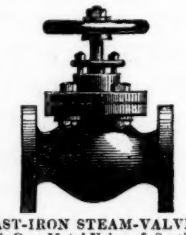
MATHER AND PLATT,
SALFORD IRON-WORKS, MANCHESTER,

Beg to call attention to their Revised List of Prices of VALVES, TAPS, &c. They also request the notice of Water Companies and Hydraulic Engineers to their IMPROVED SLUICE-VALVES for Water. The Slides have Gun-Metal Facings, are of wedge form, and when screwed down are tight on both sides.



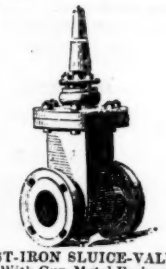
GUN-METAL TAPS.

Bore.	Price.
¾ inch	£0 4 0
1 „	0 4 6
1¼ „	0 6 0
1 „	0 8 6
1¼ „	0 11 0
1½ „	0 14 0
1¾ „	0 18 0
2 „	1 2 6



CAST-IRON STEAM-VALVES.
With Gun-Metal Valves & Seatings.

Bore.	Price.
2 inches	£1 2 6
3 „	1 17 6
4 „	2 15 0
5 „	3 15 0
6 „	4 17 0
7 „	6 0 0
8 „	7 5 0
9 „	8 15 0
10 „	10 10 0
11 „	12 5 0
12 „	14 0 0

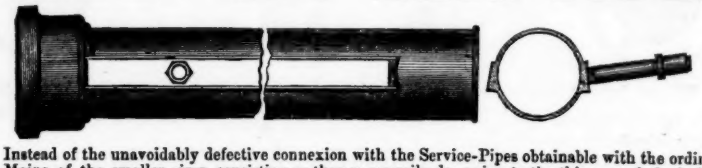


CAST-IRON SLUICE-VALVES.
With Gun-Metal Facings.

Bore.	Price.
2 inches	£1 10 0
3 „	2 5 0
4 „	3 0 0
5 „	3 16 0
6 „	4 14 0
7 „	5 14 0
8 „	6 16 0
9 „	8 0 0
10 „	9 6 0
11 „	10 14 0
12 „	12 4 0

Prices and particulars of all other forms and sizes can be had on application.

CATHELS'S
PATENT
RIBBED GAS MAIN-PIPES.



Instead of the unavoidably defective connexion with the Service-Pipes obtainable with the ordinary Gas-Mains of the smaller sizes, consisting as they necessarily do, owing to the thinness of the body of the Pipe, of but two or three imperfectly formed threads, too often shaken loose and leaky by the mere ramming of the ground over the Service when laid, or subsequently rendered so by the oscillation caused by the traffic over them, the above simple and inexpensive expedient, by giving a proper thickness of metal where it is required to tap into, ensures a PERFECT AND PERMANENT GAS-TIGHT JOINT, with little extra weight of iron.

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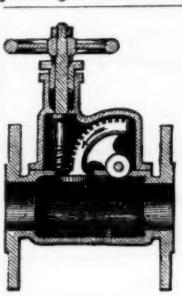

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It will be seen, by reference to the drawing, that by this simple method a clear water-way is obtained, the disc being drawn by the screw or worm entirely out of the way; thus all the advantages of the ordinary sluice-valve are obtained at much less cost, and the liability to set fast and get out of order entirely obviated. They are adapted for all purposes for hot or cold water, and equally suited for high or low pressure; and in case of need of repair, a new valve-seat can be applied without removing the body or case of the valve.

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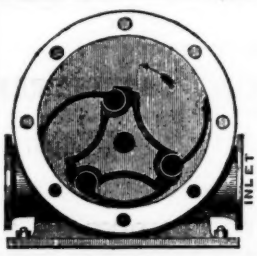

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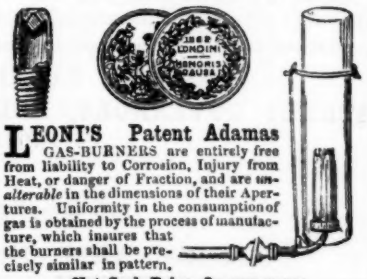

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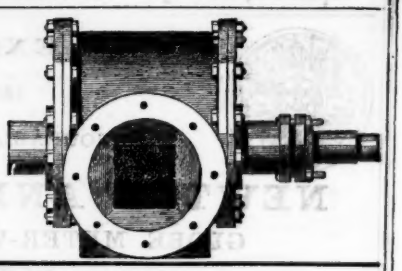

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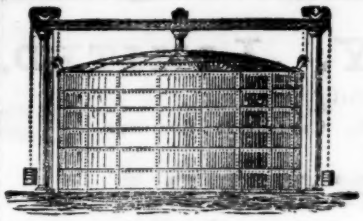

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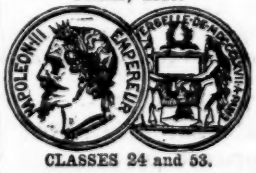

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